ILLUSTRATED
ELECTRICAL REVIEW
A Journal of Scientific and Electrical Progress.

VOL. 26. No. 26. WEEKLY. | NEW YORK, WEDNESDAY, JUNE 26, 1895. | $3 per Annum. Single Copies, 10 Cents.

Copyright, 1895, by ELECTRICAL REVIEW PUBLISHING COMPANY, 13 Park Row, New York.

Entered at Post Office, New York, as Mail Matter of the Second Class.

VIEWS, NEWS AND INTERVIEWS.

The German emperor, it is reported, has ordered that an annual pension of 400 marks shall be paid to the daughter of Philip Reis, who claimed to be the inventor of the telephone.

Rear-Admiral Fleuriais, inventor of an electric log bearing his name, is dead.

According to the *Gas World*, the Neuhausen Aluminium Company is making calcium carbide for 6*d*. a kilogramme, or £25, 7*s*. a ton, and holds out hopes that if there be a sufficient demand it may be able to reduce the price materially for large orders. At the present moment, it is said that calcium carbide is being sold in London in two shillings two-pound tins. Herr Wedding, says the same authority, has found that there is a great difference between the acetylene yield of various samples of calcium carbide. One sample, from Pintsch's, gave 64.5 litres per kilogramme; another gave 115.7; one from the Neuhausen works gave 96.8; one made by himself gave 254.3; while the theoretical is 348.

Prof. Simon Newcomb, of the Washington Observatory, has been elected an associate academician by the Paris Academy of Sciences. He succeeds in membership the late Professor Hermann von Helmholtz.

Electric cars will not be allowed to run by the Imperial Technical Institute on the road between Berlin and Charlottenburg. Experiments showed that if the cars had been operated near the Institute the heavy current and vibrations would have affected delicate scientific instruments in the laboratory and would have made fine observations impossible. The electric cars in Boston run at frequent intervals down and up Boylston street past the Massachusetts Institute of Technology. We have heard no complaint from the Rogers Laboratory of Physics that the delicate instruments there used have been affected.

A sportsman reports from Calcutta, India, that he uses the electric light in hunting tigers at night. He sits on a raised platform in the jungle and suspends a five candle-power incandescent lamp over the bait, which is placed about 30 feet away. Batteries supply current for the light. A switch on the hunter's rifle enables him to throw on the light when he is ready to shoot. The light tends to temporarily blind the tiger and a good shot can be had before his eyes become accustomed to it.

The British navy is to have a new 30-knot combined gunboat and torpedo boat destroyer. It is to be of narrow beam and 210 feet long, with a submergeable hull and propelled by electricity.

The ladies of Mt. Auburn, one of the suburbs of Cincinnati, have asked the city authorities to replace the arc street lights with gas lamps. They say that the arc lights draw bugs which frighten them and keep the children from promenading in the evenings.

In addition to the Kioto electric road, the first opened in Japan, March 21, 1895, another is to be built between Kobe and Amagasaki, a distance of 15 miles. Electrical apparatus manufactured by native Japanese is to be shown at the Kioto Exposition.

Electricity in Mexican Mines.

Last Spring the writer made a long journey afoot through Northern Mexico, and by this method of travel learned a deal more of the electrical mining affairs of that Republic than if the journey had been done by a swifter means of locomotion. The pedestrian trip mine visiting amounted to over 200 miles (largely over the roadless Sierras and among the lonely canons), out of some 600 miles of travel in the Republic. During the trip Mexico was entered three times—from Laredo in the east to Nogales in the west, and at Juarez, in the central northern part. In a few weeks your correspondent hopes to write of electrical novelties noticed in Mexican mines.

"Civilization ends at the Rio Grande," it has often been written. This is as true to-day as ever 'twas.

W. L.

Wheeler's Electric Dental Engine.

The dental engine shown in the accompanying illustrations, for which we are indebted to the *Scientific American*, is designed to materially lessen the labor of the operator, who can, by the use of this improvement, at all times stand on both feet and work from each side of the chair with the utmost freedom. The invention has been patented by William E. Wheeler, D.D.S., 128 Lexington avenue, New York city. In Fig. 2 the engine is shown in operative position on the bracket table. The armature runs vertically between the field magnets, its shaft being cone-shaped and fitted in a cone bearing at the lower end, while on its upper end a plane-face wheel, slightly dished in the center, is detachably secured. At one side is a socket-like bracket, insulated from the motor body by rubber washers, and in the socket turns the vertical stem of a standard with which is connected a horizontal arm normally pressed downward by a spring. The outer end of the arm is bifurcated, and in the members are journaled the drill-operating spindle, on which is a friction wheel with a rubber rim contacting with the plane-face drive wheel on the upper end of the armature shaft. One of the members of the bifurcated arm has a downwardly bent extension adapted to engage a notched segmental support, and by lifting the arm and shifting the friction wheel toward the periphery of the drive wheel the speed is increased, while by shifting the friction wheel toward the axis of the drive wheel the speed is proportionately diminished. By moving the friction wheel to the opposite side of the drive wheel the direction of

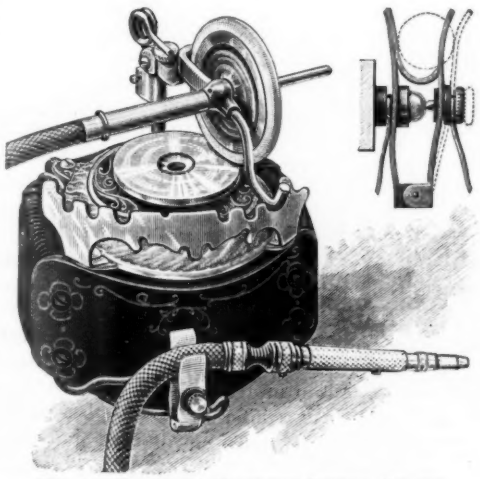


FIG. 1.—WHEELER'S ELECTRIC DENTAL ENGINE.

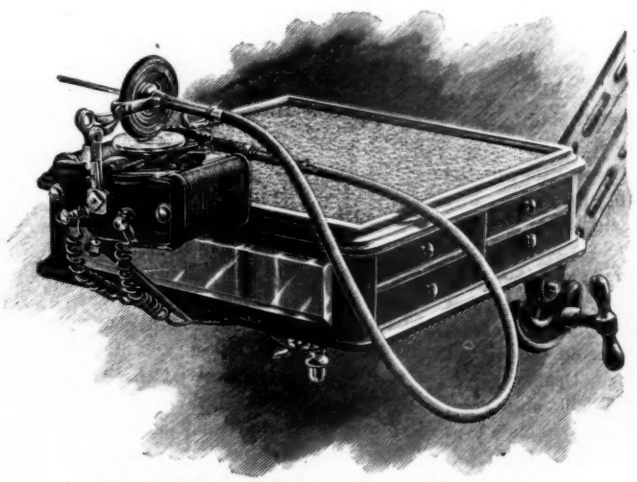


FIG. 2.—DENTAL ENGINE ON BRACKET TABLE.

rotation is reversed, and when the friction wheel is held centrally over the dished portion of the drive wheel, the rotation of the spindle ceases. A threaded extension on one of the bearing arms receives the internally threaded sleeve to which is secured the cable, in which is the flexible shaft of the drill, and on one side of the motor is an automatic switch and cable rest, shown in the small figure. It consists of a pair of spring clasp-like arms, with which are connected the + and — terminals of the circuit wire. The arms are separated when the cable is supported in the rest, as indicated by the dotted lines, the circuit then being broken and the motor stopped; but when the cable is lifted out of the rest, as would be the case when work is being done, the terminals contact, close the circuit and set the motor in operation.

Toledo, Iowa; Not Toledo, Ohio.

To the Editor of Electrical Review:

I find in the issue of the Electrical Review bearing date June 5, 1895, you call attention to the organization of the Commercial Telephone Company, and cite as the place of its location, Toledo, Ohio, instead of Toledo, Iowa. As this organization has its main office and headquarters at Toledo, Iowa, and I find a great deal of correspondence coming from advertisers in your journal is addressed to Toledo, Ohio, and is delayed, I think the next issue of your Review should correct this so that correspondence would come to the company at Toledo, Iowa.

Very truly yours,
Mutual Benefit Association.
L. E. Baker, Secretary.
Toledo, Iowa, June 17, 1895.

The Welsbach Fad.

[*From the Boston News Bureau.*]

The general understanding is that a syndicate is being formed to buy the entire capital stock of the Welsbach company at $60 a share. The United Gas Improvement Company is said to be willing to sell at that figure, and a number of large holders will also sell. The syndicate is not yet fully made up. Deal involves raising about $6,000,000, and when stock is purchased the syndicate proposes organizing a new Welsbach company with a large capital. Present company is said to be making net profits of over $1,000,000 a year on capital of $525,000.

Are Electrical Men Wanted in South America?

Two correspondents of the Electrical Review in Oklahoma Territory ask us if we know of any railroad company that wants telegraph operators and linemen to go to South America. They say they have heard that such a company is shipping men from Galveston, Texas, on three-year contracts. We know nothing of the matter and shall be glad to hear from any reader who does know about it.

It is reported that the semi-monthly payroll of the Westinghouse Electric and Manufacturing Company has been steadily increasing and now amounts to about $80,000.

The New Otis Inclined Railway at Lake George.

One of the modern engineering achievements is the new inclined railway at Lake George, just completed for the Horicon Improvement Company by the Otis Engineering and Construction Company, of New York. This railway is some 7,000 feet long, extending from base to summit of Prospect Mountain, an elevation of 2,300 feet. The engine house is located at the summit, where also is the electric light plant which furnishes light for the admirably arranged Lake House and cottages at the base of the mountain, overlooking the beautiful and picturesque Lake George. The road is constructed with all modern appliances of safety and convenience, a telephone in each car communicating with the stations, by which conversations can be held while cars are in motion. There are two large cars, one at each end of a steel cable, passing on a switch half way up the mountain side. Mr. E. D. Baldwin, of the Otis company, and Engineer Brown, are to be congratulated over this second proof of their success, a similar inclined railway having been put in operation some time ago on another mountain of New York State.

The magnificent view from the top of Prospect Mountain, the hospitality of the Lake House, and the waters of Lake George were enjoyed last week by a party of guests from New York city through the courtesy of that prince of hosts, General Passenger Agent George H. Daniels, of the New York Central; General Passenger Agent J. W. Burdick, of the Delaware & Hudson; General Superintendent J. C. Yager, of the Wagner Palace Car Company; and the Horicon Improvement Company. The party left New York at 7 P. M., June 15, arriving on its return at 7 A. M., June 17. At points along the line the party was increased by newspaper men and State officials. Among the guests were Julius Chambers, Chas. W. Diehl, F. B. Schell, Chas. W. Price and Hugh Hastings, of New York; Col. H. L. Bridgeman, Major H. F. Gunnison, Captain Ernestus Gulick and Lieut. Wm. Berri, of Brooklyn; and these with over 50 others spent a delightful day sightseeing, concluding with a banquet at the Lake House, presided over by State Treasurer Colvin.

No more attractive spot than Lake George, with these latest improvements, is compassed by the boundaries of New York State. The unanimous prophecies of the observing editors were that the improvements of the Horicon company, under the broad-gauged supervision of General Manager Peck, would prove an increasing attraction to Lake George, and place the Lake House and environments in the front rank of refined Summer resorts.

The large electric light station in the city of Manilla, Philippine Islands, installed by the Brush Electric Company, was completed in May. It has a capacity of about 15,000 incandescent lamps and 300 arcs.

The Martin Conduit Electric Railway System.

Mr. M. I. Martin, of Chicago, is the inventor of the conduit electric railway system illustrated herewith. It is an open slot conduit and is operated by an underground trolley extending from the car through the slot which is located in the center of the track.

The construction of the track and roadbed is made as substantial and simple as possible. All the parts are made in duplicate and come from foundry and mill ready to set in place. The sectional view of track construction shows the principal

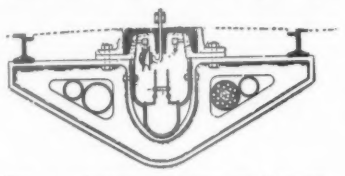


Fig. 1.—Sectional View of Martin Conduit Road.

features which it is proposed to use in the electrical equipment of the road. The conductors which will carry the currents are flat rails suspended on the side of the conduit and are protected on either side by the flanges of the slot rail which extend downward about five and a half inches.

The slot rail has a double flange, the inside one tapering to about three-sixteenths of an inch. The outer one is provided with a rib on its lower edge, extending the length of rail and intended to firmly hold it in place between the two angle irons, which are firmly bolted in place on either side of yoke of conduit. The slot rails and angles are so constructed that by knocking out a key at each yoke the slot rail can easily be taken out or replaced at any time should it be necessary for examining or repair-

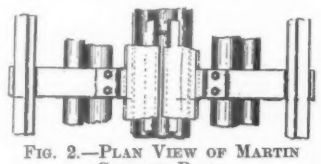


Fig. 2.—Plan View of Martin Conduit Road.

ing conduit, wires, rails or insulators, and will not in any manner interfere with street paving or the traffic of the road.

The pipes on either side are for the purpose of carrying the feed wires. The sides and bottom of conduit are made of concrete, and it is drained at intervals of about 150 feet to sewer. The yokes are of cast-iron, weighing about 250 pounds, and are placed about six feet apart. The angles are of cast-steel and slot rails of rolled steel. The track, when finished, has about the same general appearance as a cable road.

An Electric Carriage Catalogue.

In reply to the request of a western firm for information regarding electric carriages, published in last week's Electrical Review, we have received a catalogue of electric carriages and wagons from the Manhattan Electric Storage Battery Company, of New York. The catalogue has been forwarded to our correspondent.

One of the Queer Things in Patent Litigation.

To the Editor of Electrical Review:

One of the queer things in the telephone litigation is brought to mind by the odd litigation now in process in the Seventh Judicial District, United States Circuit Courts.

A suit by the Thomson-Houston Electric Company against the Western Electric Company appears to be prosecuted by the representative law officers of the American Bell Telephone Company at Boston, and defended by the representative law officers of the same Bell company in Chicago. Another singular fact in connection with this case is also that the counsel for the government in the suits against the Bell company is prominently represented with the Bell company's Boston law office in these same suits.

The writer's judgment is that an effort is being made, not so much to defend a Thomson-Houston patent, or sustain it, as between the parties to this legal controversy, as there is a disposition to obtain a rule by this Circuit Court upon questions which will later be more greatly involved in other cases.

A prophecy may not be out of place. In no other way could a certain adjudication by the Circuit Court of Appeals be had upon questions at issue in these first cases, unless, to begin with, an unfavorable decision occurred in the lower court, as in the Boston case. A reversal by the Circuit Court of Appeals in this judicial district involving grave questions may be looked for and would not be surprising.

The Telephone Protective Association of America,
J. E. Keelyn, President.
Chicago, Ill., June 11, 1895.

KIND WORDS.

"PREFERRED ABOVE ALL OTHERS."

To the Editor of Electrical Review:

You will greatly oblige me by kindly sending three copies of the Electrical Review, issue of May 22, No. 21, to my address.

In this connection it affords me great pleasure to inform you of my interest in your publication, whose advent is anxiously awaited each week. It has proven invaluable to me and is preferred above all the other electrical journals of which I take a number.

Very truly yours,
C. Urban.
Detroit, June 16, 1895.

"One of the Finest Bits of Illustration."

[*From the Chicago Inter-Ocean.*]

The illustrated Electrical Review of current issue presents as a frontispiece the historical painting, "The Projectors of the Atlantic Cable," recently presented to the Chamber of Commerce, New York. The reproduction is singularly soft and beautiful, and one of the finest bits of illustration that have recently appeared in periodical literature, and is an artistic credit to the Electrical Review.

NEW YORK ELECTRICAL SOCIETY.

ELECTION OF OFFICERS.

The annual meeting of the New York Electrical Society for the election of officers was held on Tuesday evening, June 18, at the electric power station of the Metropolitan Traction Company, 146th street and Lenox avenue, New York city. The following are the officers elected:

President, John W. Lieb, Jr.; vice-presidents, Herbert Laws Webb, Edward Caldwell, Francis Forbes, Nelson W. Perry, Prof. L. H. Laudy, Prof. Morris Loeb; Secretary, George H. Guy; Treasurer, H. A. Sinclair.

Secretary Guy made a very encouraging annual report from which the following extracts are taken:

There have been five deaths and eight resignations during the year; 33 members have been elected, and the net increase in membership is 20. The number of members now on the books of the society is 370.

Although last year the average attendance showed a marked improvement on the preceding year, during the season just concluded the society has had most gratifying evidence that its lectures have been on the whole even more thoroughly appreciated than ever. The range of subjects has been wide and in almost every instance the society has been fortunate in an able and exhaustive treatment of the theme selected. Some of the best lectures promised are still on the programme for next season, and will in all probability be delivered at an early date.

After the election the new plant of the Metropolitan Traction Company for operating the Lenox avenue line on the underground electric system was fully inspected. This system has already been described in the ELECTRICAL REVIEW.

General Electric Company Elects Officers.

The Board of Directors of the General Electric Company held its first meeting on June 12 since the annual meeting on May 14. The officers for last year were all re-elected. Mr. E. W. Rice, Jr., formerly technical director of the company, was made third vice-president and placed in charge of the engineering and manufacturing departments. No director has as yet been chosen to succeed T. K. Cummins, Jr., who was temporarily elected at the annual meeting. Mr. George P. Gardner, elected at the same time, will, it is said, remain permanently on the board.

The officers and departments of the General Electric Company are as follows: C. A. Coffin, president, Boston, Mass.; Eugene Griffin, first vice-president, Schenectady, N. Y.; Joseph P. Ord, second vice-president, Schenectady, N. Y.; E. W. Rice, Jr., third vice-president, Schenectady, N. Y.; Frederick P. Fish, general counsel, Boston, Mass.; M. F. Westover, secretary, Schenectady, N. Y.; Henry W. Darling, treasurer and assistant secretary, Schenectady, N. Y.; Edward Clark, general auditor, Schenectady, N. Y.

Selling Department (in charge of first vice-president).—S. Dana Greene, manager lighting department, Schenectady, N. Y.; W. J. Clark, manager railway department, Schenectady, N. Y.; J. R. McKee, manager power and mining department, Schenectady, N. Y.; J. R. Lovejoy, manager supply department, Schenectady, N. Y.; D. Mazenet, manager foreign department, Schenectady, N. Y.

Treasury, Accounting, Collection and Credit Departments (in charge of second vice-president).—Treasurer, Assistant Treasurer and General Auditor as above; Henry W. Darling, collections, Schenectady, N. Y.; H. P. Schuyler, credits, Schenectady, N. Y.

Manufacturing and Electrical Department (in charge of third vice-president).—John Kruesi, manager Schenectady works, Schenectady, N. Y.; G. E. Emmons, assistant manager Schenectady works, Schenectady, N. Y.; W. C. Fish, manager Lynn works, Lynn, Mass.; Francis R. Upton, manager Harrison works, Harrison, N. J.

Law Department (in charge of general counsel).—Hinsdill Parsons, assistant counsel, Schenectady, N. Y.; Howard C. Levis, assistant counsel, Schenectady, N. Y.

The Erie Telegraph and Telephone Company made a net gain of 149 subscribers in May. Total number connected June 1, 16,756.

The Westinghouse Conduit Railway System.

There is now on exhibition at the New York offices of the Westinghouse Electric and Manufacturing Company a model of an underground electric railway system which is attracting considerable interest. It embodies the inventions of Mr. Malone Wheless and Mr. George Westinghouse, Jr. The patents taken out by Mr. Wheless were controlled by the Electro-Magnetic Traction Company, of West Virginia, but have recently been acquired by the Westinghouse company. Mr. Wheless' system has been practically tested in Washington, D. C., where a line three-quarters of a mile long was laid last Fall on North Capitol street and successfully operated all of last Winter. Another line is in operation at the new plant of the Westinghouse company in East Pittsburgh, and it was this line that Manhattan Railway officials recently inspected with a view to its possible adoption on the elevated railways of New York city. The system was originally designed for street surface traffic, but a few modifications will permit its adoption on elevated roads. The illustrations herewith show a view of the model mentioned and a plan view of a double-track road equipped with this system.

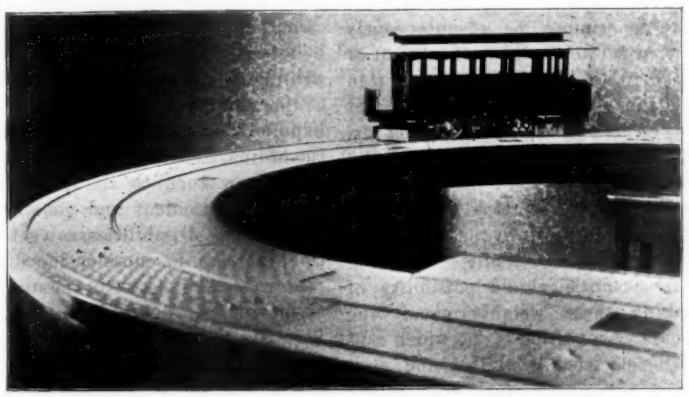


FIG. 1.—VIEW OF MODEL OF WESTINGHOUSE CONDUIT RAILWAY SYSTEM.

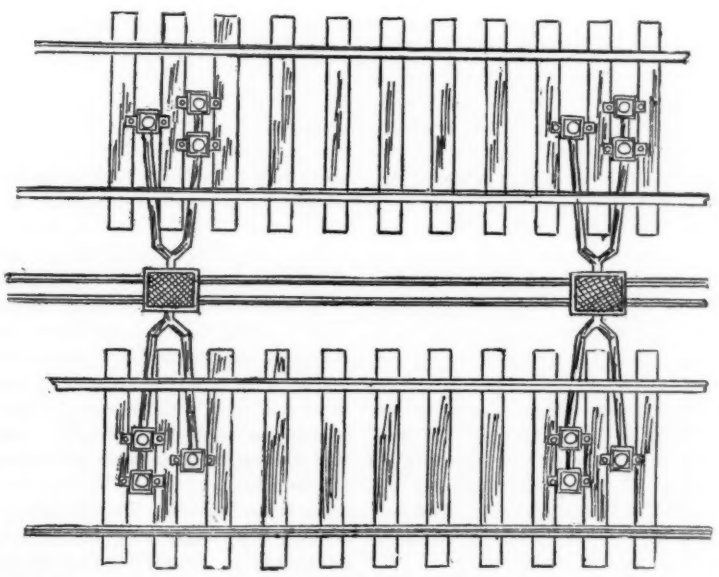


FIG. 2.—PLAN VIEW OF TRACK CONSTRUCTION, SHOWING FEEDERS, SWITCH BOXES AND TRIPLE CONTACT PLATES OF WESTINGHOUSE CONDUIT SYSTEM.

The principle of operation is very simple and the construction of the road involves a minimum amount of digging as it is placed near the surface. The feeding conductors are laid underground at the side of a single track or between double tracks. The feeders are connected at suitable intervals with automatic switches. At corresponding intervals, in the center of each track, are triple-point contact plates. Under each car are three collector bars which make a sliding contact with the triple-point plates. As the car passes over these plates a storage battery carried on the car automatically operates the switches and thus the current is thrown from the feeders through the switch to the contact points and on through the collector bars to the car motor. When the car has passed a contact plate the switch automatically breaks the connection with the feeder and the plate remains dead until the passage of the next car. The collector bars are sufficiently long to prevent sparking. It is said that the system is so arranged that overhead trolley lines can be used in suburban districts and the same car run on this underground method in city streets.

Should the Manhattan Railway Company decide to use the Westinghouse conduit system, the triple contact plates will be replaced by a succession of metal bars separated by distances varying from 10 to 20 feet.

MISCELLANEOUS ELECTRICAL NEWS.

The Woolf Electrozone disinfecting plant at Riker's Island, New York, was sold last week. It was divided for the sale into 30 lots and brought $2,577, although last year it cost the city $36,800.

Appeal from the verdict in the case of Whallon *vs.* The Sprague Electric Elevator Company for $1,711 has been promptly taken. This was a jury verdict for an accident, through the breaking of a board, to an employé during the installation of the Sprague elevators in the Postal building.

Judge Moise, of New Orleans, has allowed Henri Bier, the millionaire broker, who was convicted last month of perjury in the city railroad franchise case, to be removed from the parish prison to his home on Esplanade avenue, on the ground that he was very sick and would die if confined longer in the prison. His physician reported that death might come at any moment.

The famous old Astor House, directly opposite the ELECTRICAL REVIEW, on Broadway, is adopting electrical improvements in all departments. This house has a world-wide fame, and one of the chief causes is its fine cooking. It was a long time adding electric lights, but they finally came, and now the noiseless Lundell fan has been introduced into its restaurant, and at last cooling breezes go with the other cooling features of that department. Col. Frank Allen is to be congratulated on being abreast of these electrical times.

ELECTRICITY FOR MARINE PROPULSION.

BY PROFESSOR W. F. DURAND, IN "CASSIER'S MAGAZINE."

(Concluded from page 338.)

We will now recapitulate the principal points thus far developed. For equal amounts of energy embodied, storage batteries weigh about 550 times as much as coal, and occupy about 220 times as much space. For equal amounts of work on the shaft, the batteries weigh about 40 times as much as coal, and occupy about 16 times as much space. For the same power developed, the weight of electric motors is considerably less than that of ordinary steam machinery, while the space occupied is so small as to be well-nigh inconsiderable when compared with that required for boilers, engines and auxiliaries. For equal amounts of energy embodied, the cost of charging batteries is about 100 times the cost of coal. For equal amounts of work on the shaft, the cost of charging batteries is about seven times that of coal. For equal amounts of work on the shaft, electric propulsion will require the initial consumption of nearly twice as much coal as with steam propulsion direct, the two steam engines involved being of about equal efficiency. For equal power on the shaft, electric motors will cost nearly as much as total steam machinery. The initial cost of batteries is an item having no exact parallel in propulsion by steam machinery. The cost depends on both power and time.

The elements of weight may be put into algebraic form as follows:

Let the boat require H shaft-horsepower for a period of t hours.

Let h be the weight of total machinery per shaft-power-unit.

e, the weight of material necessary for the embodiment of one shaft work-unit, and

s, the weight. for the same unit, of stores, supplies, etc., as above explained.

We have then.

Total initial weight $= H\ (h + t\ (e + s))$.

Total initial weight per power-unit $= h + t\ (e + s)$.

These are termed initial weights, because, as the coal and stores are used, the weight on board is continually reduced. If at the end of t hours we suppose them exhausted, we shall have, as the mean weight per power-unit, $w = h + \frac{t}{2}\ (e + s)$.

For electrical propulsion, only the items represented by s are consumed, so that in this case we have as the mean weight per power-unit, $w = h + t\ (e + \frac{s}{2})$.

For the purpose of graphical illustration we will omit the items donated by s, and take the initial weights per power-unit. Taking numerical values as above noted, we have for the two equations.

For steam, $w = 200 + 3t$.

For electricity, $w = 90 + 125t$.

These equations are represented respectively by *ab* and *cd* in the annexed diagram. The much greater steepness of *cd* shows how much more rapidly weight increases with time of service for electrical than for steam machinery. It is of interest to note that with the figures chosen, there is the algebraic possibility of making the weights for the two modes of propulsion equal. The necessary condition is a very short time of service, approximating to one hour. The time of service is considered as the time required at the normal rate of running, for the discharge of the batteries.

The ordinary styles of lead cell, however, cannot be advantageously discharged in much less than eight or ten hours. An attempt to shorten the time by increasing the current will result in a loss of total capacity, and if carried so far as to attempt a complete discharge of the cell in one or two hours, reactions would arise which would result in the destruction of the plates. While, therefore, there is an algebraic possibility of making these weights equal, the necessary condition is one which cannot be electrically fulfilled, and, even if it could, a boat stored with energy for one hour only would ordinarily be of but little use. The most favorable comparison for electrical machinery is, therefore, on a basis of about eight hours' service. In such a case we should have for the two weights, 224 and 1090, showing that, at the best, electrical machinery will be about five times as heavy as the equivalent steam machinery and coal. Other figures might be taken which would vary this in one way or the other, and for short periods of time the output of the batteries might be safely increased so as to reduce this ratio very considerably. The substantial fact still remains, however, that electrical machinery will, under all ordinary conditions, be very much heavier than the steam equivalent. The dotted lines in the diagram represent what may be considered as reasonable limits in both directions for the weights in the two cases.

In the matter of first cost, it will be remembered that with electricity this item depends on time as well as power. Taking eight hours with the cost figures already given, we have for the cost of motor and battery per power unit, $270. For the steam machinery we should have, for the same unit, the single item of $40. Here, again, there is opportunity for very great variation in figures, yet the fact will remain that in first cost electrical machinery will be much the more expensive of the two.

We have now to note various peculiarities of electrical propulsion, in virtue of which the system will be found to possess certain general advantages as well as peculiar adaptations to special conditions. We first note the decrease in personnel. The batteries need no feeding and the motor and shafting require but little attention. The services of the fireman and engineer may, therefore, be dispensed with and it will be sufficient for all ordinary care if the man at the wheel, or some one else on board, has the electrical knowledge necessary to the proper manipulation of the machinery when in use.

As a still further advantage, the motor may be placed under direct control from the pilot house or forward cock-pit. This has been considered as desirable with steam machinery, but, under existing conditions, has proven difficult of practical attainment. With electrical machinery the various grades of power, as well as the reversal in direction, are obtained through the various groupings of a system of switches and resistance coils known as the controller. The combinations of the latter are effected by means of a handle or lever, placed within convenient reach of the man at the wheel, the manipulation of the handle being quite similar to that of the ordinary engine room telegraph.

We now turn to the question of liability to accident and general deterioration. Disabilities, as a general rule, increase in more or less direct ratio with the increase in the number of moving parts and rubbing joints. We have, in addition, the deterioration of boilers and storage cells, due almost entirely to chemical reactions of one kind or another. In the case of the electric motor the mechanical relations are of the simplest, and the number of moving parts are reduced to a minimum. Mechanically, therefore, the liability of the motor to accident is, with proper design, very small indeed. There is still the possibility of electrical failure, such as the burning out of armature coils, etc., but with proper design and a provision of safety fuses, this liability may be reduced to almost the vanishing point.

Comparing, as a whole, the motor with the engine, it would seem as though the liability to accident and deterioration would be somewhat less with the former than with the latter, equally good design and care being assumed in both cases. As between storage cells and boilers, it would seem fair to consider the electric installation as about the equal of the steam plant in the matter of deterioration. In the matter of dangerous disaster, the liability to fire seems to be about the same in both cases. There remains against the steam installation the possibility of disastrous explosion, a condition of which the electrical installation is entirely free.

Other advantages resulting from the nature of electrical machinery are the absence of smoke, smoke-pipe, noise and vibration. The absence of a smoke-pipe might be a considerable advantage in running about under numerous low bridges. The question of noise is, of course, relative, but in comparison with steam machinery the electric motor and shafting may be said to be practically noiseless. The question of vibration is likewise relative, but the amount is very much less than with steam machinery. The absence of steam for the operation of a whistle and a bilge-siphon may be considered as a slight disadvantage for the electric installation. A substitute for the former is readily found in a whistle attached to a cylinder in which is a plunger worked by hand. For the latter we may substitute a hand pump or some form of rotary pump attached to the main shaft.

In the matter of internal space, the superiority of the motor over the engine and boiler has been already noted. As to the batteries, however, we have seen that they will far exceed coal both in weight and volume. It is, nevertheless, true that for a boat which is intended to run for only 10 or 15 hours, the necessary supply of cells may be stowed away under seats and in otherwise unavailable places, so that no space, otherwise valuable, need be used for their accommodation. It follows that nearly the entire valuable internal volume of the boat may be made available for seating or living space.

As a further advantage, we may note that the energy in a storage battery is instantaneously available. There is no delay whatever corresponding to that necessary for getting up steam. This advantage is especially marked for service of an irregular character. The expense, too, continues only so long as there is an actual consumption at the motor. With irregular service the expense will be nearly proportional to the useful work done.

Further, the power admits of rapid and extreme variations. The objections to an extreme increase in the discharging current have been already noted, but for short periods of time such increase may be had without serious results. It thus becomes possible instantaneously to increase the power to perhaps two or three times its normal value and as rapidly to vary it to any value between this and nothing. This large reserve of power may be of the very greatest value, especially for boats which have to navigate crowded harbors or make frequent landings.

The use of storage batteries for propulsion must, of course, be limited to localities where charging dynamos are available. This, however, is by no means so great a restriction as might at first appear. Electric launches, used as tenders for yachts, men-of-war and other steam vessels, may have their batteries charged from the ships' dynamos (assuming their existence on board) when lying at the boom, or when on the chocks.

We have thus reviewed briefly the more important special considerations involved. Taking all things into account, it may be seen that the advantages of electric propulsion may, under certain circumstances, far outweigh its disadvantages. It may be seen to possess special adaptation to the service required of ships' launches and tenders, harbor police and patrol boats, small excursion and pleasure boats, and even small yachts intended for short runs.

From an engineering standpoint, the chief limitation to the extension of this mode of propulsion lies in the excessive weight of the machinery per power-unit developed. This excess is so great with present conditions that electric propulsion cannot compete with steam for either boats

powered for very high speeds or for boats in which a long period of service is required without fresh supply of energy.

Take, as an example, a launch of six tons displacement in which it is desired to put 100 horse-power on the shaft. With steam machinery this may be done with coal for six hours on about 8,500 pounds, and that without going to the extreme of lightness. With the very lightest possible construction of electrical machinery the weight could not be less than about 40,000 pounds, or about three times the entire displacement of the boat.

Take, as another illustration, a proposition to apply this mode of propulsion to transatlantic steamships. Let the displacement be 15,000 tons with 20,000 shaft horse-power, provision being made for seven days' total supply of energy. With steam machinery this might be done on about 4,400 tons. With storage batteries and motors, the weight would be in the neighborhood of 150,000 tons, or about 10 times the total displacement.

These cases are, of course, extreme, but they are given to emphasize the engineering limitations to the extension of this mode of electric propulsion. The whole limitation arises from the excessive weight of storage cells as compared with coal for equal amounts of work available at the shaft, and so long as the electrical conditions remain what they now are, so long will this mode of electrical propulsion be limited to cases requiring only moderate speed and comparatively short periods of service. Within a somewhat limited field, however, where these conditions are fulfilled, and where the special adaptations may have their full weight, this system of electric propulsion would seem admirable, and we may look with confidence for future extension within such limits.

Change in Philadelphia Telephone Officials.

It would seem that the American Bell Telephone Company had purchased the interests of the Western Union Telegraph Company in the Bell Telephone Company, of Philadelphia. On June 18 at a meeting of the Board of Managers of the Bell Telephone Company Messrs. Merrihew, Gill, Tinker, Clark, Westbrook and Plush, who represented the Western Union interests, resigned, and C. J. French and Thomas Sherwin, of Boston, Mass.; Francis B. Reeves and Joseph E. Gillingham, of Philadelphia; J. King Goodrich, of Pittsburg, Pa., and Edward J. Hall, of New York, were elected to fill the vacancies. John E. Hudson, of Boston, was elected president; A. A. Ziegler, of Philadelphia, treasurer, and Samuel B. Huey, of Philadelphia, secretary and solicitor. This leaves Gen. T. T. Eckert the only Western Union man on the Board of Managers.

The electric road between Carthage, Mo., and Center Creek is expected to be in operation the latter part of July.

ELECTRIC RAILWAY NOTES.

Electric cars at Woodbury, N. J., may be obliged to reduce speed to eight miles an hour.

It is proposed to compel electric cars in Philadelphia to reduce speed while passing school houses. Thought they went slow enough, anyway!

A fire in Seattle, Wash., on June 20, destroyed about $200,000 worth of property belonging to the Seattle Consolidated Street Railway Company.

The electric railway company at Newburgh, N. Y., has purchased Pine Point on Orange Lake, and will develop it into an attractive pleasure resort.

The Anniston, Alabama, Street Railway is now under the management of Howard W. Sexton, trustee. The Noble street line is electrically equipped. Mr. John B. Rels is acting secretary of this railway company.

Work on the electric street railway at Cottage City, Martha's Vineyard, Mass., is progressing rapidly, and the line will be in operation during the season. When the road was constructed it was opened with horses for motive power, but feed wires were laid in anticipation of electricity.

The earnings of the West End Street Railway Company, of Boston, for three days were as follows: Saturday, June 15, $28,400; Sunday, June 16, $22,100; Monday, June 17, $30,000. The earnings for June 17 were the largest in the history of the company and exceeded those for Decoration day.

Russell Sage was reported last week as saying that General Manager Hain, of the Manhattan Railway Company, had prepared a report for his company's directors of his investigation of the Westinghouse company's railway system at Pittsburgh, and would prepare another on the Metropolitan West Side Elevated Railway Company's equipment, installed by the General Electric Company, after his visit to Chicago.

There is now a continuous line of electric railway between Pittsburgh and McKeesport, Pa. The distance over this line is 10¼ miles as against the Baltimore & Ohio route of 15 miles. The trolley cars will make the trip in about 45 minutes, as against 50 minutes by steam cars. The railroad fare is 45 cents, and it is announced that the fare by the electric line will be 15 cents; at most, not more than 20 cents.

Since the Steinway company has assumed control of the Flushing & College Point, Long Island, Electric Railway, noticeable improvements have been introduced. The trolley cars are now running on a 15-minute schedule. The old cars have been repaired and new ones are to be added soon. It is said that additional switches will be constructed and that cars will then be run on five-minute headway, as on the road leading from Flushing to Long Island City.

AN INTERVIEW WITH CHARLES F. BRUSH.

ELECTRICITY DIRECT FROM COAL—FAVORS THE UNDERGROUND TROLLEY.

Mr. Charles F. Brush, the well-known electrical inventor, was interviewed last week at his handsome home on Euclid avenue, Cleveland, Ohio, by a New York *Herald* reporter. The following is an abstract of the interview:

He is a physical giant, but so well proportioned that his form commands your admiration. When Gambetta saw him at the Paris Exposition of 1881, he said: "I don't know which to admire the more in Mr. Brush, his mental attainments or his magnificent physique." Mr. Brush is about six feet two in his stockings. He is broad shouldered and big boned. His head is large, and it is fastened to his frame by a strong, well-shaped neck. He stands straight, with his shoulders well thrown back, and his chest is deep and full. He has a dark complexion and dark eyes, which show out from under heavy brows.

CHARLES F. BRUSH.

His forehead is high and full, his mouth strong and characteristic, and his under jaw firm and indicative of strength. He is now 46 years of age, and is in his intellectual and physical prime.

He retired from active business several years ago, and at that time expected to devote five days out of every week to his laboratory work and one to his business. The demands of his large property, however, are so great that he has almost reversed the order and is now devoting about five days to business and one to his laboratory. He is working to get away from business, and he hopes in the future to devote more of his time to scientific investigation and experiment. The day of his laboring hard for the dollar has long since gone by, and, while in the future his good business brains will lead him to get all the money possible out of his future inventions, still his work will be more that of scientific experiment than money grubbing for new patents.

"When did you first appreciate that your electric light might have a commercial value?" I asked.

"I think it was about 1876," replied Mr. Brush. "It was at this time that I completed my first dynamo-electric machine. I showed this at Philadelphia the next year at the Franklin Institute, and it is a curious thing that Mr. Thomson and Mr. Houston, afterward of the Thomson-Houston electric system, were present at the time. The first arc lighting machines had to have one dynamo to each light. My invention was the first that proposed a series of arc lights working from one dynamo, and it was upon this that all the street lighting and all the arc lighting systems of the present day are based."

"Will we ever get electricity directly from coal?"

"I think so," replied Mr. Brush. "In fact, I have already gotten it, but not in such a way as to make the invention commercially profitable. It is now 20 years since I succeeded in getting electricity directly from coal. It was in 1874. I used carbon as the combustible element in a voltaic battery, the electrolyte being a fused salt, or oxide, capable of fusing the oxygen for the combustion of the carbon. I tried fused caustic soda, bicarbonate of potash and oxide of lead, and got a good electric current in each case. I have not pursued my experiments in this line of work, because I thought I saw other lines which promised better and more immediate results. The fields of invention are vast. We stand just on the threshold, and there will be new inventions as long as man has mind to create and the will to investigate the great forces of nature and the possibilities of their combination."

"Do you anticipate many new inventions in electricity in the future?"

"Who can tell?" was the reply. "The electric force is still to a large extent a secret from us all. Of late years there have been few new fundamental inventions in electric lighting. There have been many improvements and modifications of the old ones. The light is steadily being made better, but it is the same light, just as, for instance, we have had locomotives drawing trains ever since we were born, but the locomotive of to-day is a far different machine from that of 40 years ago. Still it embodies the same fundamental principles."

"Where is the chief work being done in electricity to-day?"

"It is in the field of thermo-electricity, or heat electricity. It is now thought, you know, that all light and heat are produced by electrical force, and it is in these branches that the best work is now being done."

"How about patents, Mr. Brush? I once had an interview with Mr. Thomas A. Edison, in which he said that he had spent $600,000 in defending his inventions, but that he had not one minute's protection. You have had considerable experience with the Patent Office. Does Uncle Sam run his business on the square?"

"Uncle Sam may be all right," was the reply. "I have no doubt that the heads of the Patent Office are honest, but I have had a number of experiences which lead me to believe that the subordinates sometimes allow important information to leak out. I have applied for patents again and again, only to find interferences filed before they were granted, and it is only through my great care in keeping records of my work that I have been able to secure a number of my inventions. Take the arc light. While I was working upon it and attempting to make it commercially profitable I kept a very full journal of all my experiments. I recorded everything from day to day, and dated it, and had witnesses called in to sign the records. This I found of immense value to me in my patent suits. I had 200 of them, and gained all except one. This I did not care to win, as there was little in it, and I practically let it go by default. I am very sorry now that I did so, as it broke the record."

"Will storage batteries be the street car equipment of the future?"

"I don't know as to that," replied Mr. Brush. "I doubt it. You cannot run cars so cheaply by them as by the trolley. I should rather think it would be the underground trolley."

ELECTRICAL REVIEW

Published at 13 Park Row,
P. O. Box 2339. NEW YORK.

EDITOR:
CHARLES W. PRICE.
ASSOCIATE EDITOR:
STEPHEN L. COLES.

REGISTERED CABLE ADDRESS:
"ELECTVIEW." NEW YORK.

1546 "CORTLANDT," TELEPHONE CALL.

BOSTON OFFICE:
H. G. TUCKERMAN, Room 29, 620 Atlantic Ave
WASHINGTON OFFICE:
GEO. C. MAYNARD, 800 H St., N. W.

SUBSCRIPTION TO THE
ELECTRICAL REVIEW.

One Year, United States and Canada, - $3.00
One Year, Foreign Countries, - - 5.00
Single Copy, - - - - - - - - .10
Back Copies, each, - - - - - - - .25

SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

NEW YORK, JUNE 26, 1895.

CONTENTS.

PAGE

Views, News and Interviews..... 339
Electricity in Mexican Mines..... 339
Wheeler's Electric Dental Engine..... 339
Toledo, Iowa: Not Toledo, Ohio..... 340
The Welsbach Fad..... 340
Are Electrical Men Wanted in South America? 340
The New Otis Inclined Railway at Lake George. 340
The Martin Conduit Electric Railway System... 340
An Electric Carriage Catalogue..... 340
One of the Queer Things in Patent Litigation... 340
Kind Words..... 340
"One of the Finest Bits of Illustration."..... 340
New York Electrical Society..... 341
General Electric Company Elects Officers..... 341
The Westinghouse Conduit Railway System ... 341
Miscellaneous Electrical News..... 341
Electricity for Marine Propulsion..... 342
Change in Philadelphia Telephone Officials..... 343
Electric Railway Notes..... 343
An Interview With Charles F. Brush..... 343
The Berliner Decision..... 344
Death of Henry W. Frye..... 345
Wall Street and the Electrical Stock Market.... 345
Our Boston Letter..... 345
American Institute of Electrical Engineers..... 345
Late News Condensed..... 345
Murphy's Switchboards..... 346
Another Kentucky Telephone Company..... 346
General Notes..... 346
A New Electric Alarm Clock..... 346
Interlocking Rubber Tiling..... 347
Electric Lighting News..... 347
Uses of Accumulators..... 348
Telephone News and Comment..... 349
Literary..... 349
A Good Catalogue..... 349
Advance Information..... 350
The Passing of the Horse..... 351
Kindred Interests..... 352
Electrical Patents..... xi
A New Electric Light Station in Shanghai..... xi
Literary..... xii
Young Men's Institute..... xii

SUPPLEMENT.

Telephone Protective Association—Meeting at Pittsburgh..... i

INDEX OF ADVERTISERS.

COVER PAGES.

PAGE

Abendroth & Root Mfg. Co., boilers..... xviii
American Electrical Works, insulated wire. i
Armington & Sims, engines..... xviii
Boudreaux Dynamo Brush Co., a new foliated anti-friction metal brush..... i
Bunnell & Co., J. H., dry batteries..... i
Columbia Incandescent Lamp Co..... i
Day's Kerite, insulated wire..... i, x
Eastern Electric Cable Co., insulated wire.. xviii
Goubert Manufacturing Co., heaters..... xviii
Greeley, E. S., & Co., electrical supplies.... xviii
Hammond Cleat and Insulator Co..... i
Hampson, E. P. & Co., engines..... xviii
Law Battery Co., open circuit batteries..... i
Okonite Co., insulated wire..... i, ii, xviii
Partridge Carbon Company, motor and generator brushes..... i
Phœnix Glass Co., globes and shades..... i
Rhode Island Tool Co..... xviii
Safety Insulated Wire and Cable Co..... i
Standard Underground Cable Co..... i
Stirling Co., water tube boilers..... xviii
U. S. Telephone Construction Co., "M. & B." telephones..... i
Weston Engine Co., engines..... i

INSIDE PAGES.

Allen, L. B., soldering sticks..... xii
American Bell Telephone Co..... xv
American Electric Telephone Co., long-distant telephones..... xiv
Automatic Electrical Specialty Co., miniature lamps..... vi
American Watch Tool Co., bench lathes.... xvi
Bain, Forée, electrical engineer..... 352
Baillard, E. V..... 352
Baker & Co., platinum..... xiv
Baxter, H. E., & Co., electrical supplies ... x
Belden Machine Co., drop forging..... xii
Benjamin, Geo. H., patents and patent law. 352
Berliner Telephone Co., Berliner telephones xv
Bickford & Francis Belting Co., leather xvi
Boynton Multivolt Battery Co..... vii
Bradbury-Stone Electric Storage Co., storage batteries..... xi
Brill, J. G., Co., railway cars..... xiii
Brixey, W. R., Day's kerite wires and cables. x
Brodie Electric Co., automatic motor switches x
Brush Electric Co., arc lamps..... vi
Central Electric Co., okonite wire, etc..... iii
Chapman Valve Mfg. Co..... vii
Chisholm, A., & Co., commutator compound 352
Colgate Company, Geo. L., lightning arrester..... xii
Connecticut Pipe Mfg. Co..... vi
Crefeld Electrical Works, magnet wires..... 352
Crocker-Wheeler Electric Co..... 352
Cutter Electrical and Mfg. Co..... xvi
Darlington, F. W., consulting engineer..... xvi
Denny, J. T., & Co., octagon pine poles..... 352
De Veau & Co., telephones..... 352
Diehl & Co., fans of every style..... iii
Dieterichs-Warwick Co., fan motors..... xii
Dixon, Jos., Crucible Co., belt dressing..... 352
Duval, Edward S., Jr., patents..... xi
Dynamo-Electric Maintenance Co..... xii
Eddy Electric Mfg. Co., Eddy generators... xiii
Electric Launch Co..... xvi
Electrose Mfg. Co..... xiv
Empire China Works, porcelain specialties. xiv
Euler, H. C., mother-of-pearl..... 352
Faraday Carbon Co., carbons..... vii
Forest City Electric Works, commutator bars..... xii
Fort Wayne Electric Corporation, Wood electric light apparatus..... v, vi
Globe Electric Construction Co., general contractors..... xvi
Globe Electric Light Co., incandescent lamps..... vi
General Electric Co., motors..... viii
Globe Metal Works, refiners of platinum.... iii
Hooven, Owens & Rentschler Co., electric railway and electric light engines..... iii
Huebel & Manger, table push..... 352
Interior Conduit and Insulation Co., Lundell dynamos and motors..... xvi
International Correspondence Schools..... 352
Keasbey & Mattison Co., magnesia sectional coverings..... xiii
Lane & Bodley, street railway engines..... iv
Leclanché Battery Co., batteries..... xvi
Lehigh Valley Creosoting Co., creosoted lumber..... 352
Marshall, Wm., condensers..... xii
McIntire, The C., Co., connectors and terminals..... xii
Metropolitan Chandelier and Electric Supply Works..... 352
Metropolitan Electric Co..... xiv
Metropolitan Telephone and Telegraph Co.. xv
Moore, Alfred F., insulated electric wire.... xv
Morris, Tasker & Co., tubes and poles..... xiv
National Telephone Mfg. Co., Desk sets..... xv
New England Engineering Co..... xiii
New Haven Car Register Co..... iv
New York Belting and Packing Co., rubber belts..... vii
New York Insulated Wire Co..... vi
New York & New England R. R..... xi
N. Y. & Ohio Co., Packard lamps..... vii
Ostrander & Co., W. R., supplies..... xii
Partrick & Carter Co., electrical supplies for housework..... 352
Penberthy Injector Co..... xvi
Philadelphia Telephone Co, Blake transmitter..... xiv
Phillips Insulated Wire Co., wire..... 352
Pope, Reed & Rogers, patents..... xii
Proposal, Street Lighting..... 351
Receivers' Sale..... xii
Riker Electric Motor Co..... xvi
Rose Polytechnic Institute..... 352
Royce & Marean, electrical supplies..... xii
Safety Car Heating and Lighting Co..... iv
Scott Electric Lamp Co..... xi
Self-Winding Clock Co., clocks..... xvi
Shaw, Harry M..... 352
S. K. C. Electric Co..... vii
Smith, Jas., Woolen Machinery Co..... xvi
Solar Carbon and Mfg. Co., carbon specialties..... xvi
Southgate & Co., W. B., watchman time record..... xi
Standard Electric Co., arc lighting..... xii
Standard Electric Mfg. Co..... viii
Standard Paint Co., insulating tape and compound..... x
Standard Thermometer Co., arc lamps..... 352
Stanley & Patterson, electrical supplies ... iii
Stevens, H. L. C., photo-engraving..... iv
Stucky & Heck Electric Manufacturing Co. xvi
Syracuse Storage Battery Co..... 352
Thayer Electric Co., electrical engineers.... xvi
Varley Duplex Magnet Co., magnets..... xiv
Walker Mfg. Co..... vii
Washington Carbon Co., Helios carbons.... iii
Waterman, Chas. H., arc lamps..... xi
Western Electric Co., supplies..... x
Western Telephone Construction Co., telephones..... xv
Westinghouse Electric & Mfg. Co., Sawyer-Man incandescent lamps..... ix, xvii
Weston Electrical Instrument Co., measuring instruments..... x
White-Crosby Co., contracting engineers... xii
Wilkinson, W. H., automatic wiping device. 352
Worthington, H. L., electric signs, etc.... iv

THE BERLINER DECISION.

The decision of the Court of Appeals, the text of which was held back some weeks after the announcement of the result of the court's deliberations, leaves the status of the curious Berliner patent in greater uncertainty than existed prior to Judge Carpenter's decision that it was void. It will be remembered that the conclusions of the lower court were based upon two premises, either of which was fatal to the patent: 1. There were fatal delays with the patent application, instigated or abetted by the Bell company's agents; and 2, Berliner's prior patent of 1880, based upon precisely the same invention, exhausted his right to protection for the transmitter, under a decision of the Supreme Court of the United States in the recent case of Miller *vs.* Eagle Manufacturing Company.

The Court of Appeals finds that Judge Carpenter was utterly wrong as to the first ground; and simply dodges deciding the point involved in the second. It is astonishing that two so radically different conclusions can be arrived at from the same evidence. Although Judge Carpenter found enough in the actions of the Bell Telephone Company, which has owned the application from the start until it became a patent 14 years later, when coupled with the fact that it might have been issued earlier and that it contained claims which would render it dominant in the art of telephony and would give its owner a prolonged lease of 17 years in a monopoly of this very lucrative industry, to impute to the company a wrongful desire to delay its issue, the upper court finds such a conclusion absurd.

The court says:

If it were necessary to examine the motives of the company as bearing on a question of either positive or implied fraud, or on a question whether it did in fact speed the application of Berliner and its purposes in relation thereto, these facts (the prolongation of the monopoly, etc.) might become relevant as evidence, as might also the alleged great value of the microphone. But it is clear that all such allegations are irrelevant to the bill itself. So far as the law is concerned, the patent in suit is to be tested independently of the Bell patent. There can be but one law touching alleged delays in the progress of an application through the Patent Office, and touching the duty of applicants with reference thereto.

Whether the invention was from the outset seen to be valuable, or only afterward proved to be so, remains of little account. To deny this is to deny that the laws are equal, and would furnish a standard for the determination of the rights of patentees too fickle and imaginative to form a proper basis for the use of a court of law.

* * * *

One proposition of the United States, an illustration generally of what they say might have been done, we give in the exact terms stated to us at the bar:

"The duty of the Bell company was to get its patent with the least possible delay by the exercise of all its legal rights. Whatever it had a right to do to expedite an application in its own interests, it was in this case bound to do in the public interest. If a situation arose in which the commissioner was not doing his duty, and in which it would have had a right to challenge his conduct in its own interest, it was its duty to challenge his conduct in the public interest. Its submission in silence to delay directed by the commissioner in violation of his duty, was a failure in the discharge of its duty."

* * * *

The imagination can hardly put a limit to the things it had a right to do. To say, therefore, that it was bound to do in the public interest all that it had a right to do in its own, and that if it did not do this, it should pay the penalty of a forfeiture of an invention said to be extremely valuable, is a proposition so unreasonable that the mere statement of it by the United States seems to confess the weakness of their case.

* * * *

We are compelled to say that if this record suggests any dereliction of official duty, it was in the form of a continued hostility to the American Bell Telephone Company and of an indisposition to grant the application for the Berliner microphone, with a concurrent disposition to nurse and favor the Drawbaugh application, either for its own direct advantage or for the purpose of defeating inventions controlled by the defendant corporation.

* * * *

The practical summing up of all these various suggestions (of the United States) is that the American Bell Telephone Company is in effect censured for not reforming both the practice and the officials of the Patent Office. We think this demand is without parallel or precedent; that the case may justly be stated in this form, and that, when thus put, it shows itself so revolutionary as to require the legal mind to reject it on the mere statement.

So much as to the first point of the suit.

Judge Carpenter found that although avowedly very diligent the Bell agents were in reality doing all in their power to secure delay. The Court of Appeals finds that no extraordinary diligence was required, and as the Bell company did what the law specifically imposes, fraud or desire to delay is not to be imputed.

As to the second point the court holds that the question is one that is not properly raised in a suit to annul a patent, unless the fraud involved in the first question has been first proven. It therefore refuses to consider the question of identity of invention between Berliner's first patent and the one in suit; consequently the pertinency of the Miller *vs.* Eagle decision is left undecided. The court is of the opinion that this question can only be decided in a suit for infringement. Whether the Supreme Court, to which an appeal will be taken, will take jurisdiction in the case is a question of legal construction of the statute which created the Court of Appeals; so that the decision just made may or may not be final as to the government suit.

Thus the Berliner patent is still a factor of uncertain strength. In a suit for infringement the question of validity under Miller *vs.* Eagle Manufacturing Company cannot be dodged. The patent as is known to our readers contains claims covering a variable pressure microphone; the same structure exactly is described in Berliner's prior patent of 1880, which contained claims for the apparatus as a receiver, and as a system; the recent patent claims the device as a transmitter. In both patents it is precisely the same functional operation which causes it to evoke sound (receiver) or transmit it; the structure and function is the same in both; the difference is not in the instrument, but in the operator, who uses the ear in one case and the mouth in the other.

A few abstracts from the case Miller *vs.* Eagle will prove pertinent:

The patented device consists of a round steel rod, or wire spring, having at its fixed end a coil attached to the swinging beam or plow bars and extending from the coil a slightly curved arm, the outer end of which terminates in a bend or shoulder, from which the rod continues to form a short arm terminating in a sharp bend or curl at the free end of the spring. This spring is so adjusted that the outer or free end bears against the under side of an adjustable grooved roller, fixed upon an outwardly-extending arm upon the upright portion of the axle. This spring, with its adjustment, is intended to have a duplex action, covering the double effect

of either raising or depressing the beams carrying the shovels. The curvature of the spring is such that as it moves along the groove of the roller it presses against the latter at different points of its periphery, and thereby the direction of its action is shifted or changed as the position of the swinging beam is changed. Such changes in the direction of its action will assist in drawing or pulling the beam upward in a vertical direction, giving it increased leverage as the spring is moved forward in its bearings on the roller.

* * * *

The result of the authorities on this point of law is that no later patent can be issued for an invention actually covered by an earlier patent, especially to the same patentee, although the terms of the claims in the two patents may differ and the later patent may contain the broader claims, but that where the later patent covers matter described in the earlier patent, which, however, is essentially distinct and separable from the invention covered by the earlier patent and claims made thereunder, its validity may be sustained.

* * * *

The invention covered by the first patent (No. 222,767) consists in a spring which serves the double purpose of lifting or holding down the plows at will, the patent thus embracing both the lifting and depressing operations, and the later patent (No. 242,497) consists in the identical spring used for the single purpose of the lifting operation. The subject-matter being the same, no patentable distinction can be drawn between the two patents and the rule above announced can have no application to the case.

It is not the result, effect or purpose to be accomplished which constitutes invention or entitles a party to a patent, but the mechanical means or instrumentalities by which the object sought is attained. (Pencil Company vs. Howard, 20 Wall, 507; Fuller vs. Yentzer, C. D., 1877, 218; 11 O. G., 551; 94 U. S., 288.) A patentee cannot so split up his invention for the purpose of securing additional results or of extending or of prolonging the life of any or all of its elemental parts.

The claims in both patents might have been made in either patent, as they covered one and the same invention, and to hold that the second patent, which was for one part of the invention or in its function, after such part or its action had been covered by a prior patent, presents distinct invention, or that both are valid for the same invention, would involve the drawing of distinctions too refined for the practical administration of the patent law.

In the light of these judicial data it is difficult to see how the patent can survive a vigorous contest.

The reversal of Judge Carpenter's decision opens a question pregnant with consequence to the numerous manufactures who have embarked in telephony and are kept busy supplying the public with cheap and effective instruments. It is a case in which foresight and hindsight should perfectly agree, but genius is the only touchstone to reconcile the two.

Our sequence of lucky thirteens shows up again in this issue of the ELECTRICAL REVIEW, which closes another volume. It is Number 26 of Volume 26 and is published under date of June 26—all of which numbers are twice thirteen, the number of our offices on Park Row, New York city.

Death of Henry W. Frye.

Henry W. Frye, late of the *Electrical World's* editorial staff, died at Folsom, New Mexico, on June 20. Last September he had an attack of pneumonia and in January of this year went to New Mexico to recuperate. His death was caused by overexertion from riding and driving. Mr. Frye was a young man of ability, who made many friends in the electrical field. He was graduated from Colby University, Maine, and took the electrical course under Dr. Louis Duncan, at Johns Hopkins University. He joined the staff of our contemporary in April, 1892.

President George A. McKinlock, of the Central Electric Company, Chicago, spent a while at Coney Island last week, accompanied by his friends Col. E. W. Little, of the Interior Conduit Company, and Capt. W. L. Candee, of the Okonite Company. As they walked along the board walk enjoying the marine view, many observers noted their striking resemblance to the famous trio in "Trilby."

Wall Street and the Electrical Stock Market.

The improvement in the stock and bond markets continued without important set back. The movement was logical, being based upon the assurance of more than the normal yield for crops, the quickening of business along almost all lines, higher prices for commodities and a returning feeling of confidence. The prices of stocks and bonds have not discounted this improvement, although they have kept pace therewith. The past week has been rather quiet in electrical stocks. General Electric established the highest prices in the latter days, touching 36½ on Friday. In the previous week the high point was 37 on Monday and the lowest 35¾ on Saturday. Rumors of the Manhattan contract were used to depress the stock. The recovery has been gradual. The debenture bonds sold at 89 to 89½.

As was clearly shown by the ELECTRICAL REVIEW last week, all parties at interest are simply figuring upon the Manhattan railway contract, and it will be months before anything definite is determined. In fact, so remote is it that it has ceased to create more than passing interest. One phase of the situation, as I understand it, is in an examination of Manhattan into the control of the Tesla multiphase patent. The question is to be tested in a suit against Thomson-Houston by Westinghouse for infringement before Judge Townsend at Hartford, Conn. The defendant has been ordered to complete its proofs by October 7.

Last week American Bell Telephone declared a quarterly dividend of 3 per cent, and an extra dividend of 1½ per cent. The last extra dividend was 1½ per cent in December, 1894. The stock was strong this week, advancing from 204 to 205.

Edison Electric Illuminating of New York has been rather active for that stock, advancing from par to 102½. The bonds sold at 108¾ to 108⅞.

The Edison Electric Illuminating Company of Philadelphia has declared a dividend of 2 per cent, payable June 29. Books close June 22 and reopen July 1.

Edison Electric Illuminating of Brooklyn net earnings for May were $13,687, an increase over the corresponding month of 1894 of $1,212. A quarterly dividend of 1½ per cent has been declared, payable July 15 to stock of record June 30. Books open July 15.

Of the less active stocks American Telegraph & Cable sold at 96¼ and New England Telephone at 74½ and Electrical Storage Battery had a moderate rally, advancing from 28 to 30¾, on reports of improved business.

Westinghouse securities while inactive were strong. The common advanced to 35½ bid and 36½ asked, and the preferred was 53 bid and 53¼ asked. The company has declared a regular quarterly dividend on the preferred stock 1¾ per cent, payable July 1 to stock of record June 23. Books open July 1. BAIN.

New York, June 22, 1895.

OUR BOSTON LETTER.

The Whitney Electrical Instrument Company, of Penacook, N. H., have recently opened a branch office in the Erie County Bank building, in Buffalo, N. Y. Mr. Frank C. Perkins is in charge, and will carry a full line of Whitney instruments. All matters pertaining to the instrument business will receive his personal attention, and the connection will no doubt prove a profitable one to all concerned. The Whitney company have made some very important additions to their line of instruments during the past year, and they will be heard from further in this respect in the near future.

Telephone circles are rather active at present, in spite of the recent decision of the United States Court of Appeals, which seems to have carried very little interest with it and less weight, as nothing of any importance has been heard concerning it. The question of an appeal to the Supreme Court is still in abeyance, and while counsel are considering the matter, nothing definite has yet been decided upon. Lawyer Cansten Browne, of the government counsel, thus states the situation, and, while he is unable at present to say anything officially, gives it as his opinion that the case will be carried up. There are many who express a doubt of such action being taken, but the matter is, as yet, entirely undecided.

In the meantime competing telephone companies are actively engaged in pushing operations and Boston has been visited by several prominent telephone men within the past few days. S. J. Bear, secretary of the Harrison Topeka Telephone Company, is in town and has placed another order for National instruments. The Topeka company are now using these instruments almost exclusively. Detroit also has two representatives here, one a prominent city official, and the other electrician for the Detroit police department. Their object is the careful inspection of the working of the police alarm system in Cambridge, where National instruments are used on the regular two-wire service of the department, as outlined in the REVIEW some months ago, and which is the only system of the kind in the country. The gentlemen from Detroit have made an extensive tour, and have seen all the leading telephone services in the East and South, and their report will be very comprehensive. We may expect to hear something interesting from Detroit in the near future.

The recent change in the management of the Dynamo Electric Maintenance Company, of this city, is a very important one, and the company is now squarely on its feet and in the hands of some of Boston's solid financial men, who will push its business vigorously. The election of new officers will be held very shortly. In the meantime the most important change has been the severance of all connection with Mr. Robt. Ashe, formerly in charge of the New York office, which is now under the supervision of Mr. Leon Abbott, secretary of the company. The business of the company is in a very prosperous condition, and under the new regime will undoubtedly increase rapidly.

Boston, June 22, 1895.

H. G. T.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

NEW YORK DELEGATES START FOR NIAGARA FALLS TO ATTEND THE ANNUAL MEETING.

A number of delegates from New York and vicinity started from New York city on Monday, June 24, to attend the annual meeting of the American Institute of Electrical Engineers. A special Wagner car for the delegates was attached to the Southwestern Limited, which left over the New York Central & Hudson River Railroad at 1 o'clock P. M. Among those on the special car were:

Dr. C. E. Emery, H. S. Berley, M. Osterberg and sister, W. J. Hamilton, Jr., A. N. Ackerman, H. D. Reed, Jos. Wetzler, H. D. Bayne accompanied by five ladies, E. M. Sanderson, of Springfield, and R. W. Pope.

Quite a party of delegates from Boston and New England boarded the special car on its arrival at Albany.

Since the preliminary list was printed about 30 new names of those proposing to be present have been received, making the number 160 who will be in attendance.

LATE NEWS CONDENSED.

The Westinghouse Electric and Manufacturing Company has filed a bill of complaint against the Middletown, Conn., Electric Light Company, alleging an infringement of patents.

A preliminary and successful test of an electric motor car on the Nantasket branch of the N. Y., N. H. & H. R. R. was held in the evening of June 21. A reported speed of 80 miles an hour was attained and the limit even then was not reached.

The resignation of Daniel F. Lewis as president of the Brooklyn Heights Railroad Company, of Brooklyn, N. Y., has been presented to the directors and laid over for a week. There is no doubt that it will be accepted, and that Clinton L. Rossiter, the superintendent of the Buffalo division of the New York Central Railroad, will be chosen as his successor. It is believed that the system will be in future under the direction of the Flower-Vanderbilt interests.

Frank E. Grover, foreman of the Rochester, N. Y., Gas and Electric Company, who is employed at the power house at the lower falls, on June 20 received a shock of 3,000 volts of electricity, and was resuscitated after 75 minutes' hard work by a physician and three workmen. The D'Arsonval method was used. Grover is supposed to have leaned against a 60 arc light generator, and in some peculiar way received the shock. The ELECTRICAL REVIEW pamphlet giving instructions for the resuscitation of persons shocked may still be had free on application to this office.

Murphy's Switchboards.

The illustrations on this page show two types of switchboard manufactured by T. J. Murphy & Company, of New York city. Fig. 2 shows in

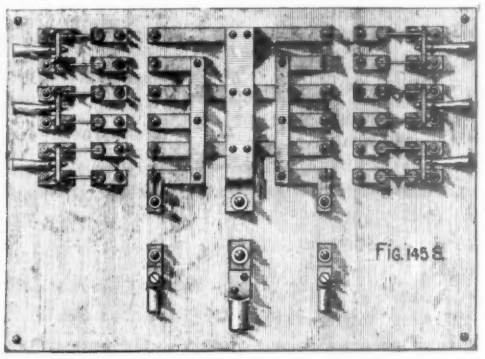


Fig. 1.—Three to Two-Wire Distributing Board.

elevation and section a handsome board installed by this firm in the new Constable Building, New York city. Fig. 1 is a three to two-wire distributing board, showing 15-ampere knife switches on each circuit. All connections are made on the face of the board.

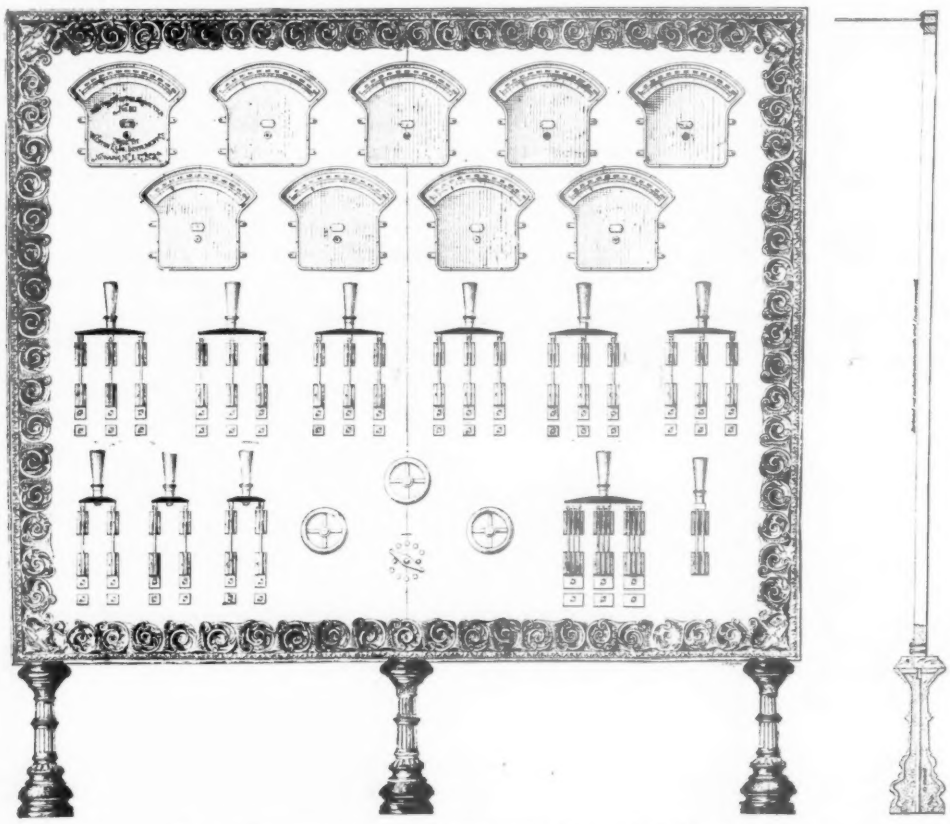


Fig. 2.—Switchboard in the Constable Building, New York City.

Proceedings in foreclosure of a mortgage for $200,000 were entered at Allentown, Pa., on June 17, by the Old Colony Trust Company, of Boston, against the Allentown & Bethlehem Rapid Transit Company; Bethlehem & Allentown Street Railway Company; Bethlehem & South Bethlehem Street Railway Company; Allentown Passenger Railway Company; Catasauqua & Northern Street Railway Company; Allentown & Lehigh Valley Traction Company; also the New York Guaranty and Indemnity Company, trustees.

Another Kentucky Telephone Company.

To the Editor of Electrical Review:

The Henderson Harrison Telephone Company, of Henderson, Ky., was incorporated on June 6 with $15,000 capital, and the following incorporators: Montgomery Merritt, O. W. Rash, H. K. Cole, W. S. Johnson, Chas. E. Dallam, S. K. Sneed, Jas. E. Rankin.

We noticed your item in the issue of the 12th, relative to the Typical Kentucky Organization at Owensboro of a Harrison Exchange, and concluded that it would be better to give you all the incorporators of this new company.

Very truly yours,
Harrison Telephone Construction Company.
H. K. Cole,
General manager for Kentucky and Tennessee.
Louisville, Ky., June 13, 1895.

Martin S. Starkweather claims that he was the conductor on the first horse car in Boston, which was put in service September 17, 1856.

GENERAL NOTES.

The Lowell & Suburban Railway Company will probably build a line from North Billerica to Billerica Center, Mass.

It is probable that the State Railroad Commissioners of Connecticut will have charge of the matter of street car fenders.

J. R. Williams, of Philadelphia, representing the Electric Storage Battery Company, of that city, is in Minneapolis, with a view of putting a storage battery plant in the new Court House and City Hall.

Under date of June 20, the Boston *News Bureau* said: It is understood that the retirement of Western Union interests in the Philadelphia Bell Telephone Company was due to the fact that the American Bell Telephone Company, of Boston, had bought a controlling interest of the Philadelphia local company and has reorganized it. The Philadelphia company has paid 12 per cent right along on its $1,000,000 capital stock, and had a better contract with the parent company than most of the other sub-companies. It has a mileage of 2,500 miles and over 6,000 subscribers. It also controlled the companies in 150 towns in Pennsylvania, New Jersey and Delaware, with about 4,000 subscribers.

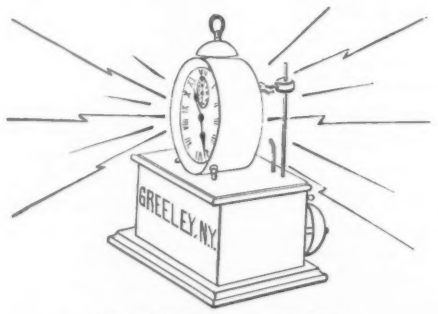
"Thistle," in the New York *Morning Journal*, wrote as follows one day last week:

Don't know what it means by the Western Union men all leaving the directory of the Bell Telephone. Something is up or something is down. Of course, it will develop in a little while. Same old story whenever men go out of a directory. "Everything is pleasant, all great friends, and just as good friends as ever were. We only agreed to serve in the directory a certain length of time; in fact, everything is all right." It means, though, that some one is getting ready to cut some one else's throat, or some one's throat has been cut. Telephone business is in a queer position now. Companies are springing up all over the United States. Hardly a town of any size that hasn't a telephone inventor or a telephone company. Understand the Standard Telephone has been trying to make arrangements with Mr. Mackay, of the Postal. Mr. Mackay is a very practical man; knows his own business and the business of a good many other people. Heard he did not want to take up the thing. Maybe he has a telephone. One thing sure, the Bell isn't the great monopoly it once was.

A New Electric Alarm Clock.

Electric alarm clocks in these days seem to be quite as common as the ordinary mechanical alarm clock was formerly. Owing to the fact, however, that the cheap popular clock of the so-called "nutmeg" pattern being subject to serious derangement by any attempt to tamper with it and provide for electrical contacts in its works, inventors have been trying to produce a device that could be used in connection with any of the various styles of the popular circular clock now on the market without any attempt to make electrical connections thereon, and this seems to have been accomplished by an inventor who has put his work into the hands of the E. S. Greeley & Company, of New York city, who are now manufacturing it.

The device consists simply of an ornamental battery box mounted in the usual way with electric bell and a time ball. The time ball is hung upon the key of the clock; the turning of the key upon release of the alarm drops the ball and completes the circuit, the bell continuing to ring until the ball is raised. The accompanying cut fairly illustrates the article in question. Of course, the clock can be set to ring the alarm at any desired hour.



A New Electric Alarm Clock.

Interlocking Rubber Tiling.

An entirely new and valuable use of vulcanized rubber is seen in the manufacture of rubber tiling for floors, halls, passageways, etc., illustrated in the accompanying engravings.

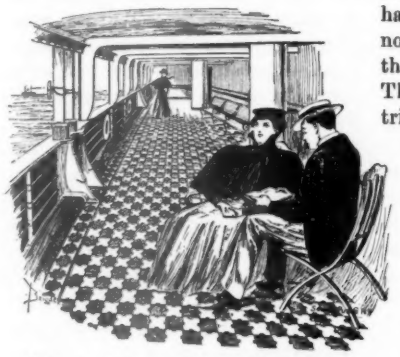


FIG. 1.—VERANDA LAID WITH INTERLOCKING RUBBER TILING.

The material is a close imitation, in appearance, of the regular earthen or composition tiling and a vastly superior article in many respects.

The New York Belting and Packing Company, Limited, 15 Park Row, New York city, are the sole manufacturers under letters-patent, and, from the favorable manner in which the new style of tiling has already been received, anticipate its general adoption in places where there is any danger in consequence of slipping or falling, where there is much traffic or wherever noise is objectionable.

Rubber tiling is furnished in different patterns, varying in size, shape and color, which by various combinations admit of being worked into a variety of designs, producing most pleasing and beautiful effects. Some results are shown in Figs. 2, 3, 4 and 5.

The effect of these as printed here, in but one color, is only partially brought out.

Because of its elastic nature this tiling yields readily to vibration and adapts itself to any unevenness and inequalities of floors upon which it is used, and the interlocking feature binds it together in such a manner as to prevent opening at joints, uniting the whole as in one solid piece. Its durability is admitted by all to be greater than that of composition or earthen tiling. Beside, it will not crack, break or scale, and its many other peculiar and desirable qualities make it in the end cheaper.

An advantage which suggests itself is the apparent ease with which this material may be repaired, in case of its becoming worn in situations where subject to excessive wear.

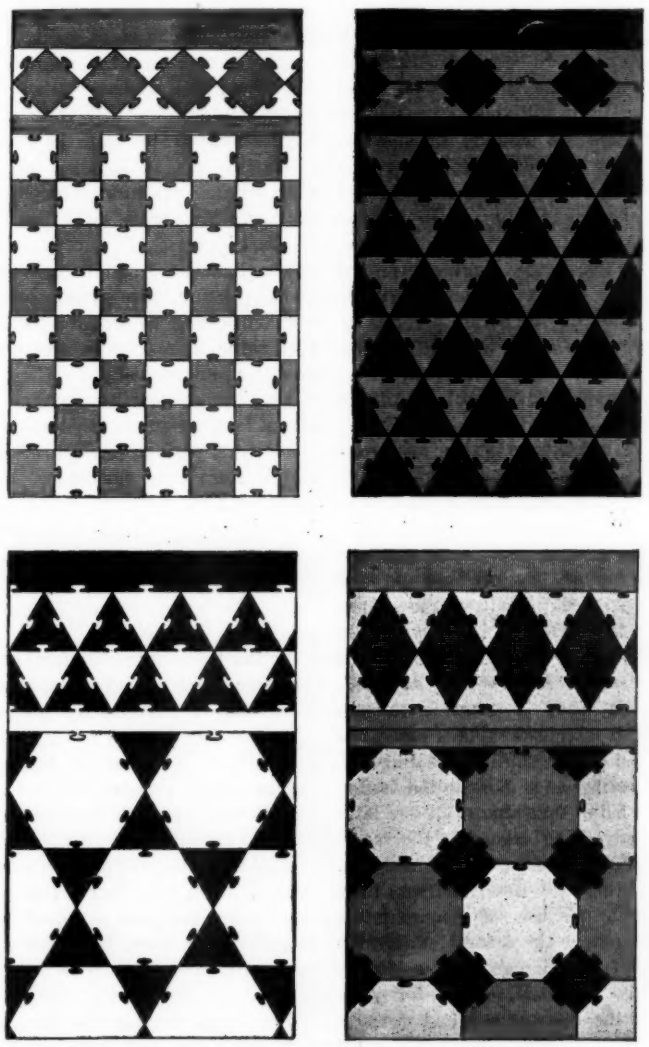
For steamships, depots, public landings and buildings generally, bath rooms, hotel corridors and places of amusement, etc., this rubber tiling appears to be especially well adapted.

At the Broad street station in Philadelphia, Pa., where the traffic is unusually heavy, it has been in use for about a year and, as yet, shows no sign of wear, while after each washing or scouring it presents the appearance of having been newly laid. One thousand two hundred and fifty and one-half square feet are used.

The large new steamships, "St. Paul" and "St. Louis," recently built by the Cramp company for the International Navigation Company, have been largely laid with this tiling. In its application to the "St. Louis" an extremely serviceable floor covering has been secured while contributing not a little, in a decorative way, to the interior beauty of the vessel. The saloon deck, second cabin, pantries, etc., are all laid with this tiling, the design shown in Fig. 2 being employed and laid in two colors, red and white.

The effect is extremely pleasing and a total of 3,500 square feet are used. This is distributed aboard the vessel as follows: Saloon deck, 2,000 feet; second cabin, 1,000 feet; pantries, 500 feet. The quality of being noiseless when trodden upon shows up to good advantage in such situations and is especially noticeable in this instance.

A handsomely gotten up catalogue, containing a number of colored plates with much interesting data regarding this new style of tiling, is furnished free by the New York Belting and Packing Company, Limited, upon application.



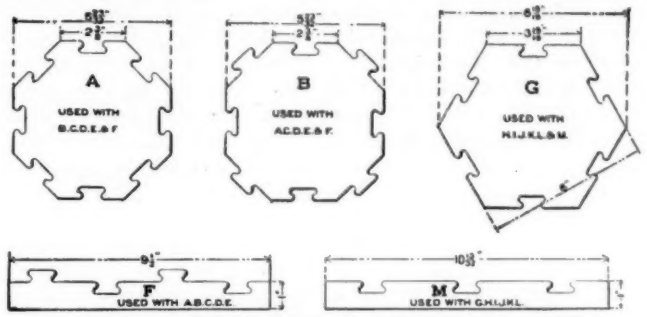
FIGS. 2, 3, 4 AND 5.—DESIGNS OF INTERLOCKING RUBBER TILING.

M. Jeantaud, whose electric carriage was illustrated and described in the ELECTRICAL REVIEW for April 3, 1895, has established an electric stage coach service between Paris and Bordeaux.

ELECTRIC LIGHTING NEWS.

Rock Falls, Ill., wants electric lights.

The question of a municipal electric lighting plant for Milwaukee, Wis., was further discussed on June 21.



FIGS. 6 AND 7.—SOME FORMS OF INTERLOCKING RUBBER TILING.

The City Council, of Independence, Ia., has closed all the contracts for a municipal electric lighting plant to cost about $20,000.

The electric light and waterworks plant having been completed and thoroughly tested were taken charge of by the city authorities of Alexandria, La., on June 5 under the six-months' trial bond.

The Pennsylvania House has passed finally the bill requiring municipalities to buy electric light plants from private corporations operating in the municipality before establishing their own lighting plants.

The Detroit, Mich., Public Lighting Commission has 489 lights in operation. July 1 that portion of the city lying east of Antoine street and west to Clark avenue will be lighted by the municipal plant. At present only that portion of the city within the half mile circle and east of Dequindre street is lighted by the plant.

The Brooklyn, N. Y., aldermen have decided to have the Ocean Boulevard, from Prospect Park to the sea, lighted by electricity, and City Works Commissioner White has been authorized to make a three-year contract for the illumination.

A correspondent writes that an electric light plant at Everett, Pa., is to be erected at a point convenient to the railroad, and as not sufficient water power could be found near the town, engines will be used. The work of wiring buildings and planting poles is now proceeding, the wiring being done by Williams & Williams, electrical contractors, Middletown, Conn.

The comparative earnings of the Edison Electric Illuminating Company of New York for May are as follows:

Edison Company only:

	1895.	1894.	Increase.
Gross	$120,586.50	$98,344.95	$22,241.55
Net	63,596.97	46,864.93	16,731.34
Five Months:			
Gross	$690,811.99	$586,403.35	$104,408.64
Net	365,868.16	$323,140.48	42,727.68

Including Manhattan and Harlem Companies:

	May.	Five Months.
Gross	$144,307.91	$811,565.16
Net	72,092.88	405,026,18

At a special meeting of the stockholders of the Edison Electric Illuminating Company of Brooklyn, N. Y., held on June 19, the capital stock of the company was increased $750,000 to $3,750,000, and the directors were authorized to issue $500,000 additional bonds, to be used in the purchase of the capital stock of the Citizens' Electric Illuminating Company, and for further extensions of the combined plants of the two companies. The vote was unanimous, 23,000 shares being represented out of 28,480.

It was announced recently that the board of trustees of public buildings has authorized and approved a contract made on May 15 by the Superintendent of Public Buildings with the Municipal Gas Company, of Albany, N. Y., for the gas and electric lighting of the Capitol and the executive mansion at $30,000 per year for a term of three years. It is claimed that the contract will result in a saving of about $10,000 a year and avoid the necessity of renewing the electric machinery at the Capitol, estimated to cost $60,000.

USES OF ACCUMULATORS.

PAPER READ BEFORE THE NORTHERN SOCIETY OF ELECTRICAL ENGINEERS, MANCHESTER, MAY 13, 1895, BY J. C. HOWELL, ESQ.

(*Concluded from Page 314.*)

That these losses are real and are actually found to exist in practice we will at once discover by reference to the Kennedy table, where we find that there was less coal burned during the period of heavy load than during the period of lighter load, that, in fact, 63 per cent of the total amount of fuel consumed was used to provide 33 per cent of the output. It will be of interest if we examine this table closely. The day on which these tests were taken was divided into three parts closely corresponding with the times as shown on a load curve where you have a minimum demand, moderate demand and maximum demand. You will notice that the amount of coal required for the moderate demand approaches very closely to the total amount required for the maximum demand, and that during the period of minimum demand, when only some 20 per cent of the maximum output was delivered, the coal bill reached the respectable figure of 57 per cent.

Let us pursue our investigations a little further and we will see that during the period of lighter load 6,385 pounds of coal were consumed, an amount sufficient working at the rate shown during the period of maximum demand to produce 1,050 units, or very nearly the total daily output required. Had we been therefore only able to provide some suitable means of storage which would have allowed us to run our engines at a fair rate of economy, there was a possible chance on that day's output of effecting a saving of two tons of coal during the run, or say £2 sterling, an amount which would perhaps go some little way towards meeting the resident engineer's salary.

That there is a practical difficulty in so running a central station plant as to work it anything like a fair efficiency, no one but a central station engineer has fully realized, and I should like here to emphasize what I have long felt, that we hear too little of the central station engineer. It may be that the exigencies of his work preclude him from attending meetings and speaking thereat, and I can well understand that the problems continually thrust upon him absolutely forbid his devoting much time to writing papers, but, if he only realized what service he could render to the manufacturers, who are always anxious to supply him with what he wants, he would, I think strain a point, and give the world knowledge of his necessities. To give you some conception of the problem that the resident engineer has to solve, I have prepared a diagram showing you the output of an American station, which I visited some time ago, and I have plotted in the way in which the load was dealt with.

The plant at their disposal was capable of dealing with a maximum output of some 18,800 amperes made up in four sets of 2,000 amperes each, and nine sets of 1,200 amperes. You will note from the marginal scale at the side that at no time during the day did the station touch an engine load factor of 80 per cent, except for a few minutes at the peak of the diagram. I have colored the various engines so that you can more clearly observe what happened during the day. You will see that, starting at one o'clock in the morning, set No. 15 colored black was kept running nearly the whole 24 hours; that set No. 11 ran from one o'clock till half past nine and, if you carefully note the level that No. 11 set combined with No. 15 would have taken, you will observe that during the whole period of minimum demand the engine load factor did not reach even 60 per cent as an average. You will further observe that at seven o'clock, when the load commenced to rise, the additional load had to be dealt with by adding small set after small set, and it was only when the load was rising so rapidly near the peak were they able to fully utilize the larger sets which ought *a priori* to be more economical to run than the smaller sets. The same criticism will apply on the down grade when the demand was decreasing. The coal consumption at this station on the day on which the curve was taken was 80 tons. On further reference to this curve you will see that the two larger engine sets were kept going at as near their maximum output as in American practice is considered safe, taking the sudden abnormal changes of load into account and that the balance of the load was equally divided over all the other sets that were at the time running. The result of this complicated system is that, although by the number of engines running the efficiency of each is somewhat increased, the regulation of the pressure on the mains is more difficult, as the adjustment to standard is only really effected when the current from the last machine is properly adjusted. That the labor involved in this adjustment is considerable is easily understood on reference to the diagram.

Reverting once more to the leaden scroll, I find that almost all our later knowledge with regard to the varied load line had been duly considered, and methods are described very fully by which the use of accumulators would relieve the central station engineer from all anxiety as to his variable demand, and following closely the instructions laid down in the scroll, I have prepared a chart showing how the methods there described would deal with the load curve which I have put before you. We are told that we must first ascertain the output for the period of minimum demand, and for what time the minimum demand lasts. These figures enable us to ascertain the capacity of the accumulators required. We observe that this period of minimum demand is very clearly defined on our load curve as lying between 1 A.M. and 7 A.M., a period of six hours. During this time an average of 2,100 amperes have been delivered to the circuit or, say, in round figures, a total of 13,000-ampere hours. To provide for this output and allow a margin for contingencies, we shall require a set of accumulators having a capacity of 14,000-ampere hours. An inquiry addressed to modern accumulator manufacturers has brought me the information that such a battery would cost delivered and erected £7,000.

On adding this battery to the equipment of the station and closely observing the rules and regulations laid down in the scroll, I find that the result upon the working of the motorial part of the machinery is that whenever an engine is started it can be kept at full load from the moment it starts to the moment it ceases running, thus bringing up the efficiency of the station to 100 per cent engine load factor at once.

Observe the result on the load diagram. Instead of the patchwork jumble of in and out engine loads, we have each set working steadily at full output as long as is required; that the hours of running have been shortened from 24 to 18, thereby lessening the number of men employed. More than this, we have been able to commence running with three of our large sets at full load from the moment of starting up to 7 A. M., and that these engines run steadily throughout the day. We notice also that when the load increases the accumulators, although discharging during the early morning hours, have already received sufficient charge to permit a discharge until three more engine sets can be started simultaneously, pointing out the advisableness of employing fewer sets of larger plant for this station.

The only regulation required is the steam pressure at the boilers, which must be kept constant, and a slight increase in the speed of the engines as the load creeps up to compensate for the slight additional loss in potential in the feeders leading the current away from the station.

Follow the curve still further and we come to a period when the engineer has to exercise his judgment as to whether he will let his battery deal with the peak, or run one of his engine sets. He chooses the former course and to provide for it he starts his blue set and keeps it running for several hours before the peak actually occurs. You will observe that at the time when this peak is about occurring, he again starts three sets simultaneously, and the peak itself is allowed to come from the battery. Three times during the day, therefore, has he to start some plant, and in each case you will observe that he has been able to put on three sets. Only once is it necessary for him to start one of his engines alone.

Now I shall very probably be told that owing to the variation in the electro-motive force of the battery during charge, the regulation of the charging current will be an exceedingly difficult matter. A diagram carefully copied from the leaden scroll will show at once how exceedingly simple this regulating matter is. One of the steam dynamo sets is expressly made to give just the current rate necessary for properly charging the battery and no more. The set devoted to this work in the station before us is the black No. 15. This set is capable of charging the battery at 2,000 amperes, and the dynamos are so wound that when necessary higher volts can be obtained from this set than from the other sets. It is the first to be started up, and it is the last to leave off, and is, during the whole day, prepared to charge the battery except at the time when the output called for is in excess of the current generated by all the sets in combination. It is kept permanently attached to the regulating ends of the battery, as you will see from the diagram. An adjustable switch is so arranged that the terminals of the machine can be attached to any cell in the regulators, so that as the end cells get charged up the switch may be moved down until it reaches the cell which is in connection on the discharge side with the terminals of the other sets and with the circuit.

You will note, also, that the loss in charging the accumulators is very slight, as it is only felt by one unit of the plant, and is really in the load diagram before you only one per cent of the total load delivered to circuit, as the proportion between the load dealt with by the accumulators and the total output is just slightly over eight per cent. But what have we gained? Even the most casual glance will show you how immensely simplified the station work has become, a certain number of engines running, a certain amount of steam required, the engineer in charge directing everything with quiet confidence, knowing full well that he has a big reserve always behind him capable of dealing with an extraordinary demand, or with any little accidental occurrence such as a hot bearing or low steam pressure. In a well regulated central station with a becoming amount of pride such accidents should, I am aware, never happen, but I am credibly informed that they do sometimes occur.

But these after all are only minor advantages. No board of directors has yet, so far as I am aware, sanctioned an item for depreciation of engineering staff appearing on a balance sheet, and we must look for more solid grounds of economy before we can appeal to them. A comparison made between the two curves will at once show you that the labor bill will be considerably reduced by the employment of accumulators, and the amount of the saving is thus shown by table 2 to be £1 15*s.* 6*d.* a day.

STAFF REQUIRED TO WORK CENTRAL STATION.

Without Accumulators.					With Accumulators.			
		£	*s.*	*d.*			£	*s.*	*d.*
10	greasers at 4½*d.*	1	7	6	8	greasers at 4½*d.*	0	15	8
6	engineers at 8*d.*	2	0	0	5	engineers at 8*d.*	1	10	0
11	stokers at 5½*d.*	2	10	5	9	stokers at 5½*d.*	1	17	1
3	switchboard attendants at 8*d.*	0	16	0	3	switchboard attendants at 8*d.*	0	16	0
					2	battery men at 8*d.*	0	10	8
30		£7	3	11	27		£5	12	6

Difference: £1 15*s.* 6*d.*

The coal bill will also shrink as we have ceased running our engines during the period when we are using our coal most wastefully, and moreover we are able to run our engines at full load whenever they are running. Carefully working out the amount of coal required for each engine, we shall see that we have brought down the amount from 80 tons, which I have mentioned as being the amount consumed on the day on which this load curve was taken, to 67. Our oil bill and petty stores have also been reduced in almost the same proportion, and it is probable our bill for repairs to the motorial portion of our plant will be decreased somewhat, although this I will not at present take into account. You will also have observed in your comparison of the two curves before you that three engines that were at work in the first curve have not been required to run at all in the station when fitted with its accumulator system. We thus save the lubrication bill on these engines entirely, and the saving has been, therefore:

	£	s.	d.
Labor bill.....	1	15	6
Thirteen tons of coal.	13	0	0
Lubrication, say.....	0	4	6
Repairs	0	0	0
	15	0	0

But in order to effect this saving we have been compelled to make an outlay of £7,000 in a class of plant which, in the minds of most engineers, should submit to a heavy charge for depreciation. We have not forgotten this, and will therefore set aside a sum sufficient to meet the views of these engineers by putting on the other side of our account an amount of £2 per day for depreciation and £1 per day for interest on the outlay.

The extra staff required to look after the accumulators has already been dealt with in our labor table. The net saving therefore is reduced to £12 per day, or, say, £4,380 per annum, an amount sufficient to wipe off the whole capital cost of the accumulators in two years, and still leave a margin to go to the profit and loss account. The load curve you will see is dated June 23, and you will readily understand what this means.

Now these figures are facts and can be proved up to the hilt. They do not admit of argument, and since they apply to a station arranged on a scale very much larger than anything we have hitherto built in this country, they effectually dispose of the usual modern criticism that accumulators may be very well adapted for small stations, but are absolutely inapplicable to supply stations dealing with large outputs.

Another criticism and a fairer one would be that by taking coal at a value of 20*s.* per ton I have exaggerated the saving on the capital outlay. This is true, but those who care to puzzle out the problem will find that the economy is sufficiently marked at any value for coal to warrant the adoption of accumulators, and they will also find that the only satisfactory method of doing away with accumulators entirely is to work up their demand curve to a straight line extending over the whole 24 hours, an occupation which the old scribe quaintly observes "will take them all their time."

It will be seen, therefore, that wherever there exists an intermittent demand for a supply of electricity an electrical storage system is a necessity, unless the cost of the initial power is so abnormally low that the interest charges on the accumulator outlay amount to more than the annual saving to be effected. Such causes do sometimes occur when an abundant supply of water is available close at hand.

Intermittent demand for power is the rule in the majority of our manufactories to-day, and although hitherto we have been content to meet this demand by transmitting our power by means of steam pipes, countershafting and belting, the day is not far distant when electrical methods of transmission will be the rule and not the exception. In all these cases the leaden scroll is emphatic in pointing out the application of accumulators, and you will readily perceive from what has already been said that to obtain the utmost economy accumulators will be absolutely necessary, for they enable us to reduce the initial power put down, and furthermore permit us, whenever the utilization of the power takes place some distance from the spot where it is generated, to economize in the conductors, as they need not be of a sectional area greater than will carry the average current instead of the maximum with efficiency.

In this district, where underground transmission of power is becoming more and more common in all your collieries, you will assuredly find in the near future batteries of accumulators installed in the underground galleries in chambers such as you see on the wall, the difference in value of the highly insulated conductors leading in having been found to cover the cost of the system of storage, without taking into account at all the other economies found to exist in the maintenance of the plant. Already electric railways have adopted electrical storage systems for equalizing their load and maintaining more equal potential over their lines, thus ensuring a regularity of train service not to be attained by any other means.

I could go on quoting from the scroll, pointing out numberless other instances where accumulators would be of the greatest service, but our time is already far spent and I shall not weary you to-night by elaborating the matter further. There is, I think, a sufficient basis of fact on the scroll to warrant our seriously considering whether the methods we are to-day adopting for dealing with the electrical supply of towns are in the majority of cases the most suitable methods, and I feel sure that the question of coal economy has not been gone into with anything like the care it should be in the design of many stations now at work and in course of construction. The high coal bill shown in many districts where coal is cheap is sufficient evidence of this. I trust, therefore, that the discovery of this scroll may be of some slight service in drawing the attention of the younger members of our profession to a closer study of this question, and I shall be only too pleased if the discussion on the points raised will lead to greater interest being taken in the subject.

TELEPHONE NEWS AND COMMENT.

An effort is being made by Doudna, Branson & Company to establish a telephone system for Barnesville, Ohio, says the *Enterprise* of that pretty little town. It will be put up as soon as 50 subscribers can be obtained. The charges will be $18 for private use and $24 for a business office.

The Mutual Automatic Telephone Company gave a public exhibition of the working of its systems at its offices, 35 Wall street, New York city, on June 10. President J. Wesley Allison received the visitors. The company claims to have already secured 7,000 subscribers in New York and 3,000 in Brooklyn.

The following press dispatch from Topeka, Kas., was recently published in a Kansas City, Mo., paper:

The Harrison Telephone Company has been reorganized under the name of the Topeka Telephone and Electrical Company. The capital stock was increased from $25,000 to $100,000. Of this amount Simon Greenspan, who recently married the rich widow of Colonel Allen Sells, takes $25,000. C. E. Reed, of this city, also takes $25,000. The remainder, not held by members of the old company, is taken by eastern capitalists. The new company will have its headquarters here. It will manufacture its machines here, too.

The directors of the American Bell Telephone Company on June 12 declared a regular quarterly dividend of 3 per cent and 1½ per cent extra, payable July 15, to stock of record June 29. Books close July 1 to July 15, both days inclusive. The directors voted to call a stockholders' meeting June 24, to vote on an increase in capital stock; books close for that meeting June 24 to 26, both days inclusive. The directors recommend that stockholders vote an increase of $1,000,000 capital stock, or 10,000 shares, to be sold by auction to the extent that stockholders may fail to take it at the price to be named by the Commissioner of Corporations.

The annual meeting of the stockholders of the Erie Telegraph and Telephone Company was held in New York on June 11, President Levi Sprague in the chair. The following board of directors was re-elected for the ensuing year: Abner S. Adams, Chas. E. Adams, Chas. J. Glidden, Francis Jewett, J. W. C. Pickering, Asa C. Russell and Levi Sprague, of Lowell, Mass.; Wesley A. Gove, of Boston, Mass.; Harvey A. Whiting, of Wilton, N. H.; H. D. W. Burt and H. F. Stevens, of New York, N. Y. The directors organized by re-electing last year's officers, who are: Levi Sprague, president; Charles J. Glidden, secretary and treasurer; James P. McKinstry, of Cleveland, Ohio, general manager.

Edward P. Meany, Melville Egleston, James E. Caldwell, Leland Hume and T. Dwight Webb have taken out a charter as the American Telephone and Telegraph Company, of Tennessee, the purpose being to manufacture electricity for telephoning purposes, constructing and operating lines of telephone and telephone exchanges; to construct a telegraph line from a point in the northern boundary line of Tennessee in Montgomery County, through the counties of Montgomery, Robertson, Sumner, Davidson, Cheatham, Dickson, Humphreys, Benton, Carroll, Gibson, Crockett, Haywood, Tipton, Fayette and Shelby to the city of Memphis; from Nashville through the counties of Davidson and Sumner to a point on the north boundary line of the State in Sumner County; from Nashville through the Counties of Davidson, Rutherford, Bedford, Moore, Coffee, Franklin, Marion and Hamilton to a point in Hamilton County on the southern border of the State; through the counties of Hamilton, Rhea, Roane, Morgan and Scott to a point in the north boundary line of the State in Scott County.

LITERARY.

The programme of the Massachusetts Institute of Technology, Boston, for 1895 has been received. An excellent four years' course in electrical engineering is decribed in the programme.

"The Telephone Systems of the Continent of Europe," by A. R. Bennett. Cloth, 436 pages, 169 illustrations. Price, $4.50. Longmans, Green & Company. Sent postage free on receipt of price by the ELECTRICAL REVIEW Publishing Company, 13 Park Row, New York.

This is a history in detail of the telephone systems of European countries up to date. The headings for each country run in general as follows: History and present position, services rendered to the public, tariffs, switching arrangements, hours of service, subscribers' instruments, outside work, both local and trunk, payment of workmen and operators, statistics. The author, who is an English telephone engineer of more than 15 years' experience, has had unusual facilities for acquiring full and accurate data on all the questions involved in the subject. This data has been arranged in an orderly and logical manner and attractively expressed. To any citizen desiring to inform himself on the telephone question, and especially to those actively engaged in the telephone business, this work should appeal with special force. No telephone library is complete without it.

A Good Catalogue.

W. R. Ostrander & Company, 204 Fulton street, New York, have issued the tenth edition of their revised catalogue of speaking-tube hardware, electric bells, electric light supplies, telegraph and telephone goods and general electrical supplies. The catalogue is standard size, six by nine inches, and is consequently easy to file. The goods described are modern and up to date, and only such as might be expected from such an old established firm as W. R. Ostrander & Company.

ADVANCE INFORMATION.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies, new telephone companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week.

New Telephone and Telegraph Companies.

MIDDLETOWN, N. Y.—A new telephone company has been formed here with a capital of $10,000. G. A. Swalm, Jr., secretary of the company, would like to receive bids on construction, and bidders are requested to draw up specifications for building a plant for 250 subscribers. The company wants telephones.

CREEDE, COLO.—It is reported that a new company has been organized by Creede business men to construct a telephone line from this city to Bachelor.

WASHINGTON, D. C.—A company to be known as the Columbian Standard Telephone Company has been organized in this city with L. G. Hine, president; Felix Agnus, vice-president; George W. Cross, general manager. The company is to operate in Maryland, the District of Columbia, Virginia and West Virginia.

RICHMOND, VT.—The Richmond & Huntington Telephone Company has been organized. The following officers were elected: A. E. Ellis, president; J. C. Sabins, secretary; F. B. Gillette, A. E. Ellis, W. E. Hanks, directors; A. Hanks, auditor. Capital, $15,000.

SPARTA, WIS.—A telephone line connecting this place and Cataract is soon to be built by D. W. Cody, proprietor of the stage and mail line.

TAMPA, FLA.—The Citizens' Telephone Company is now an assured fact. The articles of association have been entered into. Officers: S. J. Drawdy, president; A. C. Clervis, vice-president; John Trice, treasurer; C. H. Keller, secretary and general manager. The board of directors is composed of S. J. Drawdy, A. C. Clervis, F. C. Bowyer, John Trice, P. O. Knight, Charles S. Wilcox, John Savarese, George N. Benjamin and Frank Bentley.

CLARIDON, OHIO.—The Electric Telephone Company has been incorporated with a capital stock of $2,000.

WINDOM, MINN.—An electric light plant is to be established.

TOPEKA, KAS.—Topeka Telephone and Electric Company has been organized to succeed the Harrison Telephone Company, with A.K. Rogers, president; S. J. Bear, secretary and manager, and H. T. Ewing, assistant manager and electrician.

NORFOLK, VA.—The Southern Electric Service Company is petitioning for franchise to construct underground conduits for telephone system, etc.

DETROIT, MINN.—The Detroit Telephone Company has been incorporated with a capital stock of $10,000.

SAN FRANCISCO, CAL.—The People's Mutual Telephone Company has been incorporated. Capital stock, $5,000,000, with James L. Crittenden, of Oakland; Robert A. Freidrich, of Alameda, and John T. McCrosson, William H. Chapman and Reuben Tucker, of San Francisco, as directors.

SAN FRANCISCO, CAL.—The Commercial Telephone Company, of Alameda County, has been incorporated. Capital stock, $100,000, with E. R. Smith, Albert L. Stetson, John W. Butler, J. D. Johnson and S. T. Lunt, of San Francisco, as directors.

Electric Light and Power.

MONTREAL, P. Q.—The Dominion Parliament has reported favorably a bill incorporating the Hamilton & Lake Erie Power Company, with power to build a raceway between the Welland River and Lake Ontario, for the supply of power to Hamilton, St. Catharines and other points. The Welland Power Supply Company objected to the raceway going through Welland County, and a proviso was inserted prohibiting work in Welland County. The bill was amended so as to prevent any interference with navigation, and making the plans subject to the approval of the governor in council. The stock is $1,000,000, and bonding power for $1,000,000 is given.

ATKIN, MINN.—The village bonds for $10,000 for electric lights were sold to J. J. McDonald, of this place, at par.

WAUPACA, WIS.—A central plant to furnish heat, light and water will be put in at the Veterans' Home, to cost about $10,000.

CHATHAM, N. Y.—The Chatham Electric Light, Heat and Power Company has been incorporated. Capital, $10,000. Directors: John H. Farrell, of Albany, and H. M. Francis and J. O. Carr, of Schenectady.

WORTHINGTON, MINN.—This village voted to put in an electric light plant, and also to issue bonds for the construction of the same to the amount of $15,000.

TOPEKA, KAS.—The Topeka electric light plant has been sold to T. E. Burton for the Brush Electric Company, of Cleveland, O., for 25 cents on the dollar.

LA FAYETTE, IND.—J. M. Richey has sold a half interest in the Fowler electric light plant to William Deyhle, of Frankfort.

OCEAN CITY, MD.—The Warfield Manufacturing Company, of Baltimore, has been awarded the contract for lighting the city by electricity.

FERGUSON, MO.—Downs & Ashbrook have about completed their electric light plant, for which they were recently granted franchise.

COLUMBIA, ALA.—George L. Campbeel can give information concerning contemplated establishment of electric light plant.

CHATHAM, N. Y.—The Chatham Electric Light, Heat and Power Company, of Chatham, Columbia county, has been incorporated; capital, $10,000; directors, John F. Farrell, of Albany, and H. M. Francis and J. O. Carr, of Schenectady.

CLEVELAND, OHIO.—Specifications for electric light plant for Bellefontaine, Ohio, are on file at the Mayor's office, and at the engineers', E. P. Roberts & Company, Cuyahoga Building, Cleveland, Ohio. No copies will be sent out. Bids closed June 25, 1895. Material, electrical: Two arc dynamos, total capacity 100 lights, and lamp and lines complete. Also 650-light alternating current dynamo and converters; erected complete. Power, steam: One 100 horse-power and one 60 horse-power engine. Two 60x16 boilers, heater, pump, injector and piping. Gas engines, 150 horse-power in two or three units, with shafting. With inquiries send stamped envelopes for reply.

DAWSON, GA.—The Mayor can give information concerning $10,000 worth of bonds to be issued for an electric light plant.

WESTMINSTER, MD.—The Westminster Electric Light Company is putting in a 50-light dynamo, etc.

BROOK HAVEN, MISS.—F. F. Becker has, with others, organized a joint stock improvement company with a capital stock of $200,000 to establish an electric light plant, etc.

CHICAGO, ILL.—The Hammon Lighting Company has been incorporated by William P. Engel, C. E. Griffin and others. Capital stock, $210,000.

INDIANAPOLIS, IND.—Manufacturers' Building and Power Company has been incorporated by Julius D. Pratt, Addison Bybee, Nathan Morris. Capital stock, $100,000.

CHARLESTOWN, W. VA.—Certificate of incorporation has been issued to the Economy New Light Company with a capital of $50,000. Incorporators are: George O. Chilton, Moses V. Donnally, George W. Summers, Mrs. Mollie S. Donnally and Mrs. Minnie V. Noyes, all of Charleston.

HALLETTSVILLE, TEX.—A new electric light plant is to be established. It will include 900 light dynamo and 85 horse-power engine.

SANDSTONE, MINN.—The Sandstone Supply Company has been incorporated by Clarkson Lindley, E. C. Cooke and G. W. Bestor, Minneapolis; John Farrington, St. Paul; F. L. Olunce, Sandstone. The object of the company is the supplying of water, light and power. Capital stock, $25,000.

WILLMAR, MINN.—Steps are being taken to establish an electric light plant.

CARROLL, IOWA.—Carroll Electric Light and Power Company reported as having recorded real estate mortgage for $5,000.

BEATRICE, NEB.—North American Power, Light and Traction Company has been organized by ex-Senator A. S. Paddock, F. A. Paddock, F. Murphy, of Omaha; M. Stein, of New York city; R. S. Forbes, of Washington. Capital stock, $1,000,000.

New Electric Railways.

PORT HURON, MICH.—Jos. A. Thick has secured the contract for building the Port Huron and Lexington railroad for $40,000, also the contract for building the electric railroad from Saginaw to Bay City for $42,000.

TIFFIN, O.—The Tiffin & Fostoria Electric Railway was sold at sheriff's sale. The purchasers were the Interurban Rapid Transit Company, which is composed of Lewis Selle, M. Frost, A. Betts and F. N. Noble, of this city; Norman McCarty, of New York, and O. G. Evans, of Cincinnati. The road was bid in at $19,784, two-thirds of its appraised value. The Tiffin Electric Street Railway and the Tiffin Street Railway, which were also offered for sale, received no bids.

TROY, N. Y.—Work has been opened on a new electric road between this place and Sand Lake.

LITTLE FALLS, N. Y.—The Little Falls Electric Street Railway has been incorporated with a capital of $75,000.

CAMDEN, PA.—The Camden Horse Railroad Company has converted their North Second and Third street line into an electric road. It is proposed to make a cross-town line of this road in the near future, connecting with all the ferries.

NEWBURGH, N. Y.—The Newburgh Electric Railroad Company has bought Pine Point at Orange Lake, and will erect a $10,000 hotel upon it.

LITTLE ROCK, ARK.—Articles of incorporation of the Little Rock Electric and Traction Company have been filed in Arkansas. Incorporators: Samuel Carr, R. T. Paine, Isaac T. Burr, Allston Burr, Arthur Perry, Francis Peabody, Jr., H. A. Pevear, S. W. Fordyce, C. F. Penzel, W. E. Hemmingway and G. B. Rose. Capital stock is $500,000. This company will operate the electric street car system of Little Rock.

WARREN, OHIO.—The North Trumbull Rapid Transit Company has been formed to construct a passenger and freight electric railroad from Farmdale to Mesopotamia, a distance of 20 miles.

WATERLOO, IOWA.—An electric street car line to connect Waterloo and Cedar Falls will probably be built.

STILLWATER, MINN.—Stillwater Street Railway Company, W. M. Hewitt appointed receiver. Chattel mortgage reported for $5,225.

WASHINGTON, D. C.—The Washington and Great Falls Electric Company has been granted permission to issue $500,000 in bonds to build its road. The line is about six and a half miles long, and the trolley system will be used. Stilson Hutchins is president.

LOUISVILLE, KY.—A movement is on foot to build an electric line from Louisville to Fairfield.

HINGHAM, MASS.—Another electric railroad will probably soon be built under the name of the Brockton & North Easton Street Railway Company. Capital stock, $50,000.

MONROE, MICH.—Monroe Street Railway Company has been granted a franchise to construct an electric road on the several streets in Monroe. The company will furnish electric power and may possibly furnish electricity for lighting.

New Manufacturing Companies.

BRIDGTON, ME.—Bridgton & Harrison Electric Company has been organized for the purpose of making and distributing electricity in the town of Bridgton. Capital stock, $10,000. President, G. P. Locke, of Norway; treasurer, C. A. Scribner, of Bridgton.

PORTLAND, ME.—Jacobson Blosser Electric Company has been organized for the purpose of manufacturing and dealing in all kinds of tools, etc. Capital stock, $200,000. President, C. B. Jackson, of Boston; treasurer, Alfred Prince, of Quincy.

AUGUSTA, ME.—Electric Directory Company has been incorporated. Capital stock, $100,000. The directors are F. E. Sanborn, Portland; E. H. Peabody and T. G. Daly, of Boston; W. S. Baldwin and J. E. Wade, of Augusta. The purpose is to own and operate electric city directories, electric and railroad time-tables, etc.

ATLANTA, GA.—The Southern Electric Development Company has been incorporated by Robt. Robinson, Robert F. Shedden and J. H. Gilbert for the purpose of dealing in and manufacturing electrical appliances. Capital stock, $10,000.

Increase of Capital Stock.

NIAGARA FALLS, N. Y.—The capital stock of the Niagara Falls & Lewiston Road was, at the last meeting of the corporation, increased from $100,000 to $400,000.

WORONOCO, MASS.—The Woronoco street railway voted to increase the capital stock to $50,000.

QUINCY, ILL.—The Empire Light and Power Company has filed a certificate of increase of its capital stock to $50,000.

CHICAGO, ILL.—Maywood and Proviso Electric Light and Power Company has increased the capital stock to $60,000.

LONG ISLAND CITY, N. Y.—The Long Island City Electric Illuminating and Power Company will increase its capital stock from $50,000 to $150,000 at an early date.

Government Bids Opened.

WASHINGTON, D. C.—Bids were opened last week at the Treasury Department, through the supervising architect's office, for the construction of hydraulic

and electric elevators for the United States Treasury building. The bidders were as follows: Otis Bros. & Co., New York, N. Y., hydraulic, $21,000; electric, $15,800; to complete in 70 working days. Morse, Williams & Co, Philadelphia, Pa., hydraulic, $26,909; electric, $22,148; to complete in 80 days. Pennsylvania Elevator Co., Bloomsburg, Pa., hydraulic, $24,862; electric, $19,717; to complete in 90 days. Standard Elevator & Manufacturing Co., Chicago, Ill., hydraulic, $18,650; electric, $15,165; to complete in 90 days.

The Passing of the Horse.

To such an extent has the horse been superseded by electric and cable railroads, the bicycle and other new methods of transportation, that the question of what to do with the thousands of horses on the ranches in the West and Northwest has become a serious problem, says the New York *Sun*. Large bands of horses in Oregon and Washington now have almost no value. The railroads refuse to ship them East unless the freight is paid in advance, fearing that the animals will not bring enough to pay the freight bills, and it is costing the owners more to keep and tend the horses than they are worth. Horses that a few years ago were worth $50 apiece have lately been sold for $2 to $3 each. A manufactory for utilizing the now useless horses by turning them into oil, glue and fertilizing material, extracting the tallow, and in various ways making use of the hair and skin, is actually being built near Portland, Ore., a corporation with considerable capital having been organized for the business. This company has recently bought between 5,000 and 6,000 horses at an average of $3 a head, and it will be easy, it is said, to get as many more as needed at the same price. One band of 1,100 horses, grazing in Oregon and Idaho, was bought for $2,000. The fertilizer is to go to Hawaii for use on the sugar plantations. The concern will not go into the business of canning horse meat for human consumption either here or in Europe. Some sentimental objections have been made to the enterprise, but those interested declare they are doing a public good in ridding the country of the now useless horses.

Mr. J. H. Vail, 39 Cortlandt street, New York, has been engaged by the Wilkesbarre, Pa., Electric Light Company as supervising and contracting engineer for the building of a large electric lighting and power station. The company has purchased a valuable culm bank in Wilkesbarre, containing upwards of 140,000 tons of excellent coal, and propose erecting a modern power house and new steam plant on the property. When the new station is completed the company will be in a position, it is claimed, to manufacture electric current at as low a price as it can be produced in this country, excepting from cheap water power. The work is expected to be completed in from three to four months.

PROPOSALS, STREET LIGHTING.

The Board of Trustees of the Village of White Plains, N. Y., will, until

MONDAY, JULY 8, 1895,

receive sealed bids for lighting the streets of said village, for a term of three years, upon the following propositions:

First Proposition—50 arc electric lights of 1200 candle-power each, and 175 gas lights of 20 candle-power each; all-night lighting.

Second Proposition—50 arc electric lights of 1200 candle-power each, and 175 incandescent electric lights of 20 candle-power each; all-night lighting.

Bids to state the price per light per year for which lights will be furnished; the Board of Trustees to have the privilege of ordering additional lights, of either kind, at the contract price.

Specifications in detail may be had upon application to the Village Clerk.

Proposals to be received by the Village President.

Dated White Plains, N. Y.,
June 3, 1895.

By order of the Board of Trustees.
David Cromwell, President.
Wm. B. Sutherland, Village Clerk.

ESTABLISHED 1867

PARTRICK & CARTER CO.

ELECTRICAL SUPPLIES

125 South 2d St. Philadelphia

CATALOGUES ON APPLICATION

Send Business Card and Mention ELECTRICAL REVIEW.

THE LEHIGH VALLEY

CREOSOTING CO.

WORKS, PERTH AMBOY, N. J.

Office, Rooms 136 and 137, 1 Broadway, NEW YORK.

Creosoted Lumber, Underground Conduits. Telegraph Poles, Piling and Ties Furnished.

EXPERIMENTAL WORK.

Metropolitan Chandelier and Electric Supply Works,

HUDSON & 12th STS., HOBOKEN, N. J.

Arc Light Repairing.

Electrical Instruments and Fine Machinery.

MODEL AND EXPERIMENTAL WORK. R. R. COMMUTATORS REFILLED.

E. V. BAILLARD, 106 Liberty St., N. Y.

FOR SALE.

1,000 OCTAGON PINE POLES,

26 to 28 ft. long. Other Sizes Cut to Order.

J. T. DENNY & CO., BUIE, N. C.

MOTHER OF PEARL

Made into any design for Electrical Trimmings, Push Buttons, Knobs, Handles, etc. Can be made to cost no more than other material.

HENRY CHARLES EULER,

513 BROADWAY, NEW YORK.

Sight Feed Oil Cups.

AUTOMATIC "WIPING DEVICE"

For oiling Crank and Cross-head Pins.

WM. H. WILKINSON & CO.,

352 Atlantic Ave., Boston, Mass.

DIXON'S BELT DRESSING

AND LEATHER PRESERVATIVE.

WE GUARANTEE DIXON'S BELT DRESSING TO PREVENT SLIPPING AND TO PRESERVE THE LEATHER. SEND FOR CIRCULARS AND TESTIMONIALS.

JOS. DIXON CRUCIBLE CO., JERSEY CITY, N. J.

WEATHER-PROOF TRADE MARK "O.K." LINE AND HOUSE WIRES

AGENCIES:

ELECTRIC APPLIANCE CO., CHICAGO, ILL.

PETTINGELL-ANDREWS CO., BOSTON, MASS.

ELECTRICAL ENGINEERING CO. MINNEAPOLIS, MINN.

ST. LOUIS ELECT'L SUPPLY CO., ST. LOUIS, MO.

BRADFORD BELTING CO., CINCINNATI, O.

PHILLIPS INSULATED WIRE CO.,

NEW YORK OFFICE: 39 & 41 Cortlandt Street.

FACTORY: PAWTUCKET, R. I.

FIRE.

The destruction of our Works by fire on April 7th was almost complete.
We have already resumed manufacturing and are making limited shipments, which are daily increasing.
Send us your orders. We will fill them with reasonable despatch, or advise you promptly if we cannot.

CROCKER-WHEELER ELECTRIC COMPANY,

Manufacturers and Electrical Engineers.

New York. Chicago. Boston. Philadelphia.

Sizes up to 250 H. P.

Two New and Valuable Telephone Books.

1st

"THE TELEPHONE SYSTEMS OF THE CONTINENT OF EUROPE."

BY BENNETT.

Price, - $4.50.

This book just issued describes the Systems in all the European Countries, covering the following points:

History and Present Position.
Services Rendered to the Public.
Tariffs.
Way-Leaves.
Switching Arrangements.
Hours of Service.
Subscribers Instruments.
Outside Work—Local and Trunk.
Payment of Workmen and Operators.
Statistics.

NO TELEPHONE LIBRARY IS COMPLETE WITHOUT THIS.

2d

"A MANUAL OF TELEPHONY."

BY

WM. PREECE AND A. J. STUBBS.

Price, - $4.50.

This is a very comprehensive and practical book. It is divided into the following "parts," under which are several chapters devoted to different branches of the subject:

Part I—Transmitters and Receivers.
" II—Apparatus and Circuits.
" III—Simple Telephone Exchanges.
" IV—Multiple Switches.
" V—Miscellaneous Switching and other Systems.
" VI—Construction, Wires and Cables.

Both these important books supplied, post-paid, on receipt of price by the

Electrical Review Pub. Co.

13 PARK ROW,

NEW YORK.

KINDRED INTERESTS

John Starr, Son & Company, Limited.—In a recent note referring to this company, the ELECTRICAL REVIEW inadvertently accredited them to Montreal, P. Q. The firm is located at Halifax, N. S., and is well known in Montreal and the other large Canadian cities.

B. J. Launiere, formerly secretary of the Grand Rapids Machinery and Electric Company, has recently been employed as traveling salesman by the Metropolitan Electric Company, 186 and 188 Fifth avenue, Chicago. Mr. Launiere is a man of ability, well liked by the trade and is meeting with great success in the sale of electrical supplies.

The Electric Launch Company, Morris Heights, New York city, has issued a beautiful and valuable catalogue entitled "Electric Launches." A great deal of information on the subject is given and the work done by the company since the great success of its fleet of electric launches at the World's Fair in 1893, shows that its methods and products have been steadily progressing. Mr. J. Chester Chamberlain, the manager and engineer of the company, is probably the best informed man in this country on the question of electric boats and boat building.

The Falls Rivet and Machine Company, Cuyahoga Falls, Ohio, report that their business is picking up. They have just received a very large order from the Diamond Match Company for the power transmitting machinery which will be required in equipping the new match factory which they are building at Liverpool, England. The order consists of shafting, ring oiling bearings, gearing, friction clutches, steel rim pulleys, etc., and to say the least, the Falls Rivet and Machine Company are very much elated to think these parties should prefer their machinery to that manufactured by the English. They have, however, fitted up several of the match company's large factories in this country, and the work has always given them entire satisfaction.

WANTED.

An electrical engineer and manager is open for an engagement. Has been successfully managing and installing large plants for the past 15 years. For the past four years has been installing for one company three large plants, which will be finished in about one month when the advertiser will be open for an engagement. Thoroughly understands electric light and power work in all its details. Will go anywhere. Highest reference.

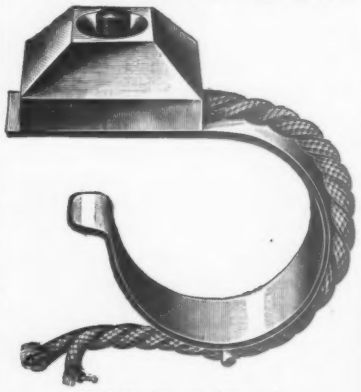
Address *Electrical Engineer,*
Care ELECTRICAL REVIEW, New York.

ROSE POLYTECHNIC INSTITUTE,
Terre Haute, Ind. A School of Engineering. Mechanical, Electrical, Civil Engineering, Chemical courses. Well endowed. Extensive Shops and Foundry. Modernly equipped Laboratories in all departments. Expenses low. Address C. L. MEES, President.

FORÉE BAIN,
ELECTRICAL AND MECHANICAL ENGINEER,
SUITE 1657, 1658 AND 1659
MONADNOCK BLDG., CHICAGO.

GEO. H. BENJAMIN,
45 BROADWAY, NEW YORK,
PATENTS AND PATENT LAW.

TABLE PUSH



Send for new catalogue of
BELLS, PUSH BUTTONS, Etc.
HUEBEL & MANGER,
286-290 GRAHAM ST., BROOKLYN, N. Y.

STEAM ENGINEERING

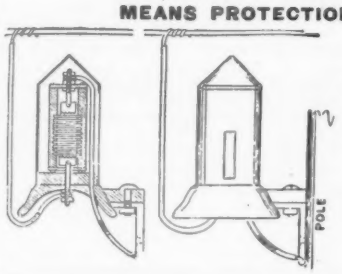
(Stationary, Locomotive or Marine); Mechanics; Mechanical Drawing; Electricity; Architecture; Architectural Drawing and Designing; Masonry; Carpentry and Joinery; Ornamental and Structural Iron Work; Railroad Engineering; Bridge Engineering; Municipal Engineering; Plumbing and Heating; Coal and Metal Mining; Prospecting, and the English Branches. Students make rapid progress in learning to Draw and Letter. The Steam Engineering course is intended to qualify engineers to secure Licenses. Send for Free Circular, stating the subject you wish to study, to

TAUGHT BY MAIL THOROUGH PRACTICAL

THE INTERNATIONAL CORRESPONDENCE SCHOOLS, Scranton, Pa.

THE UNIVERSAL NON-ARCING RAILWAY AND CENTRAL STATION LIGHTNING ARRESTER

MEANS PROTECTION AGAINST LIGHTNING.



It combines all the successful principles and material construction of a Positive Arrester.

The UNIVERSAL allows the static charge to pass freely to earth and at the same time proves an effectual barrier to the passage of the dynamo current.

Write for Circular and Discount.

HARRY M. SHAW,
136 Liberty Street,
New York, U. S. A.

YOU DO NOT MAKE AN ERROR WHEN YOU BUY THE PRODUCT OF THE

SYRACUSE STORAGE BATTERY CO.

UNDER LICENSE OF

THE CONSOLIDATED ELECTRIC STORAGE CO.

(THE BRUSH PATENT.)

The **BEST** in every way for all purposes where it can be applied. **IMPOSSIBLE** to buckle or short circuit. **SEVEN** electric lighting plants recently installed. Testimonials furnished.

Factory at PHŒNIX, N. Y.
Office: 38 and 39 Herald Building, SYRACUSE, N. Y.

THE UPTON ARC LAMP

FOR ALL CIRCUITS.

The Cheapest to Buy, Use and Maintain.

Direct current lamps, constant potential, with globe and resistance, to burn 8, 11, 14 hours	$12 00
Alternating current lamps and globe	14 00
Series current lamps and globe	14 00

Standard Thermometer Co.,
PEABODY, MASS.,
The Original Manufacturers of the
SIMPLEX, WARD AND KNIGHT LAMPS.
CHARLES A. BRAMHALL, SELLING AGENT, 39 CORTLANDT ST., N. Y.

Telephones,
TRANSMITTERS, RECEIVERS AND APPLIANCES.
De Veau & Co.,
32 and 34 FRANKFORT ST.,
NEW YORK.

PEERLESS
COMMUTATOR COMPOUND.

The only perfect *Commutator Lubricant* on the market. Used and indorsed by prominent users everywhere. Is put up in stick form. It is the only compound that gives entire satisfaction on all kinds of equipment.

A *trial order* will best convince you of its merits.

Liberal trade discount.

A. CHISHOLM & CO.,
BAY CITY, MICHIGAN.

"CREFELD" ELECTRICAL WORKS,
MANUFACTURERS OF
MAGNET WIRES
And Insulated Wires of all kinds.

AGENCIES:
BRADFORD BELTING CO., Chicago.
BRADFORD BELTING CO., Cinn.

OFFICE AND SALESROOM:
620 Atlantic Ave.,
BOSTON.

LEAD-ENCASED CABLES A SPECIALTY.